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INTO THE PASTORAL FOLD: ASSEMBLING A XIONGNU SOCIAL WORLD AT ELST AR

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EMMA ELIZABETH HITE

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For my mother: the first and best teacher, anthropologist, and advisor in my life

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ABSTRACT

The project focuses on the lived and constructed relationships between humans and domesticated herd animals of the Xiongnu Empire in late Iron age eastern Eurasia. The dissertation introduces three novel concepts (living materiality, relational osteobiography, and pastoral fold) developed to identify and interpret a near-universal yet undertheorized phenomenon in the Xiongnu archaeological record: their deliberate assembling of humans and herd animals together in mortuary space.

Scholars generally consider the Xiongnu to be the first imperial nomads, yet the ‘pastoral’ dimension of their mobile pastoralism remains underexplored. Building on previous scholarship, I posit that the Xiongnu pre-occupation with bringing humans and herd animals together in mortuary ritual indicates that constructing multispecies relationships was highly significant within Xiongnu imperial ideology. In particular, I hypothesize that the Xiongnu believed that their subjectivity, their “Xiongnu-ness”, was bound up in their being together with herd animals (and other people) in specific constellations of particular social beings. These suppositions emerged in tandem with first-hand research in Mongolia on human and nonhuman animal remains excavated from eight Xiongnu ring tombs at the Elst Ar cemetery, using bioarchaeological and zooarchaeological methods to generate osteobiographical data for once-living Xiongnu social beings. I integrated these data and crafted them into eight relational osteobiographies: creative, empirically-grounded interpretations of these multispecies assemblages constructed by living Xiongnu through mortuary ritual.

Comparing these relational osteobiographies indicates that the Xiongnu who buried their dead at Elst Ar enacted an overall pattern – assembling humans and herd animals– yet consistently varied the kinds of social beings they brought together in death. Such variability

and fluidity of associations working strictly with the 'raw materials' of mobile pastoralism (humans and herd animals) evokes the way mobile pastoral communities and societies organize their multispecies members: the herd. As a refinement of the herd, I suggest the term 'pastoral fold' to assemble human herders together with their herd animals as the Xiongnu did in their tombs. Each multispecies mortuary assemblage at Elst Ar was an iteration or performance of the pastoral fold: a potent yet fluid biopolitical category always under construction, always negotiating intersections of biological processes and social dynamics, and always contingent.

The iterations of the pastoral fold at Elst Ar evince a Xiongnu community for whom being and becoming a subject, a being that mattered in the socio-cosmological order, was to be embedded in relations with other herders and herd animals. Such a possibility represents a radical shift in interpretations of the Xiongnu that implicitly assume they shared the broad Western ontological commitment to the distinctness and primacy of the human in opposition to the nonhuman. The pastoral fold instead suggests that Xiongnu political ontology was relational and material, more akin to ontogenies of being and society than transcendental categories. Entertaining the possibility that the Xiongnu viewed themselves and their social world from a radically different perspective, and enacted the logics of their views in heightened form during mortuary ritual, opens the door for further creative speculation about Xiongnu politics and ideologies constructed from the ground (or tomb) up.

CHAPTER 1

INTRODUCTION

1.1 Enter The Xiongnu

Just over 2,000 years ago, herders living on the Mongolian Plateau organized into the first nomadic empire in recorded history: the Xiongnu Empire. Although the Xiongnu Empire produced no autochthonous texts, they left behind mortuary spaces in the form of tombs and associated ritual structures, walled settlements, campsites, metallurgical production sites, and rock art across Mongolia, southern Siberia (Tuva or Tyva, Transbaikalia, Buryatia), northern China (Inner Mongolia, parts of Manchuria, and Xinjiang), and eastern Kazakhstan. Mortuary spaces were the first source of archaeological information about the Xiongnu, and archaeological investigation of those contexts has remained a crucial component of Xiongnu archaeology into the 21st century. Xiongnu tombs and the rich mortuary assemblages that they yield comprise the bulk of our empirical evidence about these first imperial nomads and their complex interactions with communities and polities across ancient Eurasia.

Two primary types of Xiongnu tomb – ring and platform[1] – are synonymous with the Xiongnu archaeological culture in Mongolia and southern Siberia, due to their overall consistencies in external and internal construction and mortuary assemblages over time and space. These consistencies together with the widespread distribution and large number of Xiongnu tombs attest to a shared repertoire of mortuary practice across time and space in the

[1]See Chapter 3

Xiongnu imperium. Xiongnu tombs may be considered diagnostic of the Xiongnu as an archaeological culture and thus as an object of analysis, but also as a material category constructed and realized through social action (Graeber, 2015) by the Xiongnu themselves.

A consistent component of Xiongnu mortuary assemblages is the remains of nonhuman animals intentionally interred along with the human occupant(s) of the tomb. Empirical evidence indicates that nonhuman animal species – their number per context, ages at death, the whole vs. partial nature of their bodies, body-part distributions, and individual counts (MNI: minimum number of individuals) – vary in mortuary contexts across the Xiongnu Empire. This variation is further complicated by the variation in nonhuman animal associations with humans at different ages, biological sexes, states of health, and individual counts[2] within the ring and platform Xiongnu tomb types. The nonhuman animals placed most consistently into Xiongnu tombs were the domesticated herd animals of North and Inner Asian mobile pastoralism: sheep, goats, cattle (cows, yaks, and their various hybrids), and horses. Together with Bactrian camels, these four taxa of livestock comprise the 'five muzzled beasts'[3] of present-day mobile pastoral lifeways in Mongolia.

Archaeologists have noted this Xiongnu practice of placing livestock remains in their tombs for decades, arguing that it demonstrates the centrality of the pastoral to Xiongnu imperial mortuary ideology and political economy (Dorjsüren, 1961; Batsaikhan, 2003; Miller et al.,

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[2]Minimum number of individuals (MNI): see Appendix D.

[3]The 'five muzzled beasts' are the domesticated herd animals that populate modern Mongolian mobile pastoral lifeways: sheep, goat, cattle (cows, yaks, and their various hybrids), horses, and Bactrian camels. "Five muzzled beasts" is the English translation of the Mongolian phrase, *tavan khoshuu mal* (таван хошуу мал). *Tavan khoshuu mal* is often translated as "the five snouted animals", "the five snouts", or "the five snouted beasts". I concur with Marchina (2016), Peemot (2017), and others in translating *khoshuu* as "muzzle" in this context. Hence, I refer to "the five muzzled beasts" throughout this project. In colloquial English terminology, horses, cattle, sheep, and goats have muzzles rather than snouts. Charles Bawden translates *mal* as "livestock" or "beasts" (1997), generally implying domesticated (herd) animals rather than wild animals. *Mal* is part of the phrase *mal am'tan* (мал амьтан): "animal". See Appendix B.

2018). However, the presence of nonhuman animals, particularly livestock, in Xiongnu mortuary contexts remains little explored and undertheorized.

In this project I investigate the consistent presence of nonhuman animal remains in Xiongnu mortuary space by shifting focus from the nonhuman animals alone to their intentional association with humans. Living Xiongnu consistently, deliberately assembled nonhuman animal remains in mortuary space, which, by definition, contains human remains. Previous archaeological research has concentrated on the nonhuman animal remains, especially from domesticated herd animals, as evidence of the centrality of the pastoral to Xiongnu beliefs and society. These approaches generally begin by separating the nonhuman animal from human remains found together in the same tombs into distinct datasets: zooarchaeological vs. bioarchaeological, respectively. This project puts these bodily remains back together tomb-by-tomb as living Xiongnu had originally assembled them.

This project builds upon previous archaeological insights into the centrality of the pastoral to Xiongnu ideologies and lifeways evidenced by livestock remains in their mortuary space by expanding its inquiry to include the human component of the pastoral. Framing the Xiongnu phenomenon of interring livestock remains in their tombs as assembling humans together with herd animals holds great potential for understanding the Xiongnu because the Xiongnu's mobile pastoral way of life has been fundamental to historical, archaeological, and anthropological perspectives on these first imperial nomads. Mobile pastoralism is linked with the Xiongnu from their earliest appearances in Chinese historical texts and from the first excavations of Xiongnu sites in the 19th century.

1.2 Mobile Pastoralism and Its Role in The Xiongnu Empire

Today scholars generally believe that the Xiongnu practiced a version of Inner Asian mobile pastoralism rooted in animal husbandry of the five muzzled beasts that populate pastoral communities throughout modern North and Inner Asia, especially Mongolia. Numerous archaeological cultures and historical groups in Inner Asia and across the eastern Eurasian steppe – encompassing Manchuria, modern Mongolia, southern Siberia (including Buryatia and Tuva/Tyva), Inner Mongolia, Xinjiang/East Turkestan, Tibet, Nepal, and parts of Kazakhstan, Kyrgyzstan, Tajikistan, Pakistan, and Afghanistan – appear to have practiced some form of transhumant animal husbandry using most (particularly a combination of horse, cattle, and sheep/goat) or all of these five domesticated ungulates over at least the past three millennia (Khazanov, 1994; Humphrey and Sneath, 1999; Anthony, 2007; Frachetti, 2012; Bello, 2016; Taylor et al., 2020).

Mobile pastoralism is often characterized as a utilitarian mode of production that maximizes animal-derived commodities, or as a niche adaptation to extreme or marginal ecological conditions. Productive lines of archaeological, ethnographic, and historical research into North and Inner Asian mobile pastoralism interrogate presumptions of the inherent egalitarianism of nomads, limited economic capacities in a pastoral mode of production, and barriers to political complexity in mobile pastoral societies. Evidence now indicates that complex social dynamics and multi-scalar political projects and institutions shape and shaped the productive strategies, economic organization, spatial practices, and societal organization of Inner Asian mobile pastoral societies in contingent, historically-specific ways (Simukov, 2007a, 2007b, 2008; Humphrey and Sneath, 1999; Bold, 2001; Sneath, 2007; Frachetti, 2012; Atwood, 2015a; Honeychurch, 2015; Marchina, 2015, 2019; Peemot, 2017).

This has been particularly true for archaeologies of political complexity in Mongolia, where the 'mobile' aspect of mobile pastoralism orients and inspires empirically grounded theorizations of spatial politics, scale, and alternative pathways to complexity (Rogers, 2012; Honeychurch, 2015; Miller and Brosseder, 2017). Archaeological research in Mongolia characterizes mobility as a suite of techniques, practices, and institutions bound up in pastoral ways of life and its imbrications with sovereignty, political economy, and social ecologies (Honeychurch and Makarewicz, 2016). The Xiongnu Empire exemplifies an imperial formation that arose from political dynamics and trajectories beyond prevailing scholarly ideas of empire rooted in settled agrarian modes of production within this mode of archaeological inquiry. While this research has done a great deal to highlight the importance of mobile pastoralism within the Xiongnu Empire, the 'pastoral' component of Xiongnu mobile pastoralism has received less attention.

The Xiongnu themselves left major clues that their relationships with their herd animals were significant enough to involve constructing or assembling those relationships in death (i.e., through mortuary practice). If the Xiongnu predominately lived a mobile pastoral way of life with domesticated herd animals and buried those animals together with the human dead, then these human-animal relationships spanned life and death. The Xiongnu signal the centrality of human-animal relationships to their beliefs and practices by consistently and intentionally associating humans and nonhuman animals (especially domesticated herd animals) together in a meaningful assemblage they created and produced again and again across time and space: as part of each Xiongnu tomb. To better investigate the relationships between Xiongnu herders and their herd animals necessitates a closer examination of the human-animal relationships, or interspecies entanglements, of mobile pastoral lifeways in North and Inner Asia.

Rather than a mode of production or political economy, this project characterizes mobile pastoralism as a multispecies endeavor, where humans and other animals (specifically domesticated herd animals) live close, complex, and highly interdependent lives. Mobile pastoralism in North and Inner Asia (Mongolia in particular) requires that humans, nonhuman domesticates (the five muzzled beasts, dogs, raptors, etc.), wild animals (deer and other game animals, fish), microbes (lactic acid bacteria, fungus [usually strains of *Candida*]), vegetal life (grasses, shrubs), and others lead interdigitating lives in order for mobile pastoralism to 'work' (personal observation; Mlekuž, 2013; Honeychurch, 2015; Hendy et al., 2021). That multispecies endeavor requires and is carried out by particular bodies in specific contexts in contingent, imbricated ways. The interspecies labor of these bodies is ambivalent and sited at the intersection of social, biological, economic, political, and ideological dimensions of a social world past or present.

Look closely at mobile pastoralism in context and a messy, multitudinous assemblage of bodies, events, affect, temporalities, and interdependencies materializes. Herders manage the reproduction of their herds through individual animals' life events: breeding, gestation, birthing, nursing, maturation, and slaughter. These life events are interactions of temporal and material dimensions of human-animal relationships, and negotiations around the constraints and contingencies of the biological and the social. From its first moments, a herd animal depends on its herders for survival and well-being; in turn, those herders depend on its survival, well-being, and maturation for their own survival and well-being. A domesticated herd animal likely owes its very existence to the herders who planned and carried out the breeding of its sire and dam, who themselves depended on the care and management of herders from their own births, and so forth.

But a domesticated herd animal is not solely an object of human manufacture, a product of human intentionality enacted upon inert matter. The biological processes of an animal – human or otherwise – that constitute it in its constant ontogenetic coming-into-being at organismal, cellular, and molecular levels follow paths that intersect with yet are not reducible to human intention or intervention. This observation holds as true for domesticated herd animals and humans as for any other members of the animal kingdom. Herders and their herds – the key components of what I call 'living materiality'[4] in a mobile pastoral context – result from and enact shared, messy, and life-long interrelationships that encompass the biological and the social.

1.3 Theoretical Framework: Living Materiality

Living materiality as a novel concept draws heavily from multispecies ethnographic work into the complexity, interdependence, and ambivalence that characterize the multispecies communities of Northern and Inner Asian mobile pastoral lifeways. Multispecies ethnography and social zooarchaeology have provided robust empirical grounds for the argument that not all societies or anthropological contexts treated humans as distinct from nonhumans, and instead often prioritized the relationships between them. Anthropological and archaeological work in these domains posits alternative ontologies to a foundational human-animal dichotomy, and investigates particular ways in which human-animal relationships shape and construct the social worlds in which they unfold. These approaches dovetail with the ontological turn, animal turn,

[4]See Chapter 4.

and posthuman turn in questioning the validity of the ontological opposition of human subject to animal object, opening theoretical terrain into the generative potentials of ontogenetic interrelationships between human and nonhuman animals.

While ethnographic perspectives on interspecies entanglements have proven eye-opening, archaeological inquiry promises to open new doors into our understanding of more-than-human worlds. For example, archaeological approaches to the world-building relationships between humans and other animals may access the complex materialities and temporalities of interspecies entanglements not easily grasped using ethnographic methods. Materiality studies forward arguments that the agentive qualities and social histories of objects render nonhuman materials indispensable to anthropological understandings of politics and sociality. However, these approaches generally struggle to account for nonhuman animals (but see Conneller, 2012, on animal materials). Recent archaeological research on materiality posits that historicity and the escalating interdependence it engenders are crucial to analyzing human-nonhuman interactions (Hodder, 2012). Furthermore, material qualities can be the differences upon which political projects may be built (Bauer and Kosiba, 2016). Drawing a narrower argument from Bennet's vibrant matter (2010) and vital materialism (2013), human and nonhuman animals are material, living, and agentive. We come into being through messy, multitudinous, and lifelong interactions with other living materials (human, animal, vegetal, molecular). Our materiality is the constant, complex union of biological and social, reducible to neither and greater than the sum of its parts.

Human and nonhuman animals share these qualities, rendering them living materiality. Living materiality conceptually supersedes ontological division between human and animal, placing humans and other animals into a common category of entangled, relational life on robust theoretical grounds. This permits close empirical examination of specific human-animal relationships constitutive of and constituted by social worlds (Haraway, 2007; Parreñas, 2015; Tsing, 2015; Govindrajan, 2018; de la Caneda, 2019). The configuration of the social in this project rests on both long-term trends in life sciences research into the sociality of nonhuman animals and movements within the social sciences, including anthropology, that identify and explore the complex relationships between humans and other living beings as fundamentally social (Fuentes, 2010). 'Social' as used in this project refers to a relational, more-than-human dynamic that binds human beings and other life forms together through their interactions, histories, biologies, and ecologies. Of particular relevance to this project is a more specific notion of 'social': the relational sociality that glues together, fosters, and constrains the living beings within a mobile pastoral lifeway who lead entangled and interdependent lives. Living materiality is thus the theoretical framework through which this project investigates the relationships between Xiongnu humans and their herd animals in life and constructed for them in death. In particularly, the perspective on multispecies relationships or interspecies entanglements offered by living materiality provides the conceptual terrain for the project's novel method: 'relational osteobiography'.

1.4 Interpretive Methodology: Relational Osteobiography

The materially mediated relationships between herders and their herd animals occur through and in the bodies of the humans and other animals who live close, entangled lives as in a mobile pastoral lifeway. The durable remains of those human and other animal bodies – bones, teeth, antler, horncore, etc. – contain records of their lived experiences as multispecies relationships between herders and herd animals (or interspecies entanglements). Thus, we can look to the skeletal remains of humans and other animals – particularly herders and herd animals who made up a mobile pastoral lifeway – to infer these lived experiences. Thanks to the apparent Xiongnu preoccupation with assembling domesticated herd animals together with the human deceased in mortuary space, archaeologists regularly encounter such records of lived experiences (i.e., skeletal remains of human and nonhuman animals).

The idea of the skeletal system as a life's record is not new. Bioarchaeology originated an analytical framework that characterizes bodies as material congealments of interactions, practices, and events: the osteobiography (Saul and Saul, 1989). The skeletal system is only one component of the body's materiality, yet it is uniquely plastic and durable. Bioarchaeology has developed a suite of methodologies to examine and interpret that materiality. In this way, bioarchaeology and its approach to the human body roughly parallel zooarchaeology and its approach to nonhuman animal bodies. Where zooarchaeology deploys the methodological tools to examine nonhuman animal bodies as material manifestations of life events and relationships, bioarchaeology analogously examines human bodies. We might call zooarchaeology and bioarchaeology together methodologies of living materiality: empirical approaches to the material remains of once-living humans and other animals capable of examining complex intersections of social and biological.

The bones and teeth that develop, grow, and react during an individual's life remain long after death, collecting the events, relationships, and practices that brought the given body into being. Such an orientation towards the human skeleton is compatible with theorizations of the body as a congealment of practice, iteration, and citation, which is constantly coming-into-being (Butler, 1993). Rather than reifying an ontological distinction between the social and the natural, the Butlerian concept of the body shifts to an ontogenetic understanding of bodies that matter as the interplay of materials in a given context. As recent zooarchaeological scholarship extends the osteobiographical perspective to nonhuman animals (Orton, 2010; Conneller, 2011; Mlekuž, 2013; Overton and Hamilakis, 2013), expanding the framework to encompass living materiality (human and nonhuman animal bodies together) productive of and produced by their daily, life-long interactions as an osteobiographical account of human-animal relationships.

I propose an expansion of osteobiography in order to reckon with how complex, material interactions between humans and other animals over the life course shape those embodiments of living materiality. The traditional osteobiographical approach analyzes a social being as a palimpsest of its past events and activities. A relational osteobiographical approach would characterize those past events and activities as aspects of relationships between social beings; human and nonhuman animal remains in context are primary evidence of those relationships. The relational osteobiography takes the traditional osteobiography from a focus on the life-history of a social being to an examination of the complex relationships between social beings that constituted a past social world. Put another way, humans and other animals constituted a past social world through their relationships, which occur at various scales, and these relationships shaped and were shaped by the engaged material bodies. The remains of these material bodies – human and nonhuman animal – contain osteological, spatial, and taphonomic information about those relationships.

Multispecies ethnographies provide nuanced, thorough accounts of human-animal relationships and thus rich information on their potentialities for constituting social worlds (Mitchell, 2002; Haraway, 2007; Dave, 2014; Blanchette, 2015; Parreñas, 2018). Moreover, these accounts excavate the oft elusive or elided political dynamics of the more-than-human worlds we all inhabit as material beings. As Juno Parreñas argues, "multispecies ethnography suggests the instability of power in our fragile worlds, which we sense through our vulnerable bodies" (Parreñas, 2015: 1). Despite the historical specificity and material particularities of human-animal relationships, multispecies ethnographies indicate some consistent features that describe those relationships: the interactions are material and bodily, the interactions that constitute these relationships occur both regularly (i.e., often daily and all-day) and over lifetimes (of nonhuman animals but also often of humans), and these interactions have specific (albeit often highly complex) spatial organization or patterning. These dimensions – material, temporal, and spatial – can be reconstructed in relational osteobiographies that combine human and animal remains in context as a unified dataset. Relational osteobiography is thus an interpretive method operating with the baseline concept of living materiality to propose empirically grounded accounts of relationships between once-living material beings. The relational osteobiographical approach to human-animal relationships finds ideal application when human and nonhuman animal material remains occur together in a given context.

1.5 Data and Context: Multispecies Mortuary Assemblages from Elst Ar

Mortuary contexts are frequent sites of such co-occurrence. As mentioned above, Xiongnu mortuary contexts in Mongolia and Siberia generally contain both human and nonhuman animal remains (primarily horse, sheep and goat, and cattle). Archaeological practice disarticulates these intentional associations of human and other animal remains, shunting the human into bioarchaeological analyses and nonhuman animal remains into zooarchaeological analyses. A relational osteobiographical approach offers a methodology for reuniting the embodiments of living materiality through the evidence of their material, bodily interactions.

In addition to lived experiences made legible when interpreted as multispecies interactions, the intentionally associated skeletal remains of humans and domesticated animals in mortuary contexts promise another line of information about the Xiongnu and their social world. Those Xiongnu who assembled certain people and herd animals in mortuary space intentionally constructed multispecies relationships in death. Mortuary space is imbued with tremendous ideological, cosmological, social, and political significance. Therefore, we may hypothesize that constructing multispecies relationships between humans and domesticated herd animals in particular was an important part of Xiongnu mortuary practice, and thus deeply significant to the Xiongnu themselves.

Each Xiongnu mortuary context contains an assemblage of particular humans and other animals, along with material culture, bounded into a discrete entity: the tomb. The abundance and spread of Xiongnu tombs strongly indicate that the Xiongnu tomb was deeply significant to the Xiongnu themselves. Indeed, a Xiongnu grave may be the closest empirical representation of a Xiongnu category that archaeologists are able to perceive and interpret. When understood as an autochthonous category repeated and made manifest myriad different times, Xiongnu tombs gain an additional significance to the archaeological imagination. This project operates from that position in analyzing specific intentional assemblages from eight Xiongnu tombs, each as discrete and intentional entities. Moreover, archaeologists debate what kinds of political subjects were buried in the most common type of Xiongnu tomb: ring burials, which are found in entire ring burial-only cemeteries or in cemeteries together with the monumental terrace or platform tombs that many scholars argue belonged solely to the highest echelons of the Xiongnu imperium (see Chapters 3 and 4). This project contributes to the ongoing discussion of who the Xiongnu buried in these ring tombs by investigating the relational constitution bodies of humans and domesticated herd animals constituted through material interaction in life and mortuary ritual in death.

The Xiongnu cemetery at Elst Ar comprises 26 ring tombs in Bulgan *aimag*, Mongolia [N48˚07'26.0" E104˚17'24.7" (48.123889, 104.290194)] located within the posited heartland of the Xiongnu Empire that runs north-south through Central Mongolia and up into Transbaikalia (Honeychurch, 2015). The cemetery contains solely ring tombs, the 'more modest' type of elite Xiongnu burial; this factor, plus its relatively small size, suggests Elst Ar was the mortuary space of a local community within the empire rather than the resting place of the upper strata of imperial society. Archaeologists from the Mongolian University of Science & Technology (MUST/SHUTIS) excavated 14 of the 26 ring tombs at Elst Ar in 2011 and 2012 (Erdenebold et al, n.d.a,b). I analyzed the human and nonhuman osteological materials recovered from eight of these 14 Xiongnu tombs stored in a MUST collections facility in Ulaanbaatar. I used bioarchaeological and zooarchaeological methods to determine (when possible): taxon/species; age at death; skeletal sex; and paleopathological indicators of activities, trauma, and disease (see Appendix D).

Like the majority of Xiongnu ring and platform tombs excavated by archaeologists, these eight ring tombs at Elst Ar bore evidence of re-opening and disturbance of their contents. Often interpreted as 'looting', post-funeral intrusions into Xiongnu mortuary contexts include the removal of grave goods and other materials and the complete or partial destruction of the original arrangement of materials within the tomb (see Chapter 4). Such known loss of archaeological data has posed challenges to the analysis of Xiongnu mortuary contexts, despite the centrality of these datasets to Xiongnu archaeology. I developed relational osteobiography as an empirically-grounded interpretive methodology with such limitations in mind. Given that archaeologists often encounter Xiongnu mortuary contexts where materials placed therein by living Xiongnu are missing and the original spatial organization of remaining materials has been partially or completely obliterated, can archaeologists still unearth meaningful, empirically-grounded information from these mortuary assemblages? I submit that it is possible: in the case of Xiongnu tombs, the human and other animal bodily materials that archaeologists encounter during excavation represent in part, or even in fragment, once-living social beings who were deliberately placed into each mortuary context. A human femoral bone found in a Xiongnu tomb must have once been part of a living person's body and skeletal system, whether or not that entire person's skeletal system was found by archaeologists in that tomb. A sheep skull must have once been part of a living sheep's body and skeletal system, whether or not that entire sheep's skeletal system was found by archaeologists in that tomb. If we posit that the living Xiongnu who assembled these human and other animal remains in mortuary ritual would have been aware of this organismal reality, and that such awareness shaped their intentional assembling of these once-living social beings, then we can gain a fresh perspective on multispecies mortuary materials and deepen our understanding of Xiongnu beliefs, values, and logics immanent in their assemblings.

Relational osteobiography targets the intentional nature of the multispecies assemblage. Zooarchaeologists often interpret such intentional associations as animal sacrifice, funerary feasting, and/or the ritual accompaniment of animal companions along with the deceased human into the afterlife. While these are often fruitful interpretations, the key point is that in such contexts humans and other animals have been purposely placed into association: a construction of human-animal relationships as a part of mortuary space.

Mortuary contexts – places imbued with great ideological and symbolic significance – are fertile soil for excavating such perceptions and values, with specific reference to the 'right' order of the cosmos. The practices that shape mortuary contexts marry the material and the ideological into exercises in persuasion: "a kind of exegesis on worldly interconnection in which claims are made about the order of things, claims that may sometimes be designed to end quarrels but that are nevertheless always open to dispute, rejection, or revision" (Fowles, 2013: 151). Relational osteobiographies result from mortuary practices that declare and perform ideologies of and about the 'right' structure of relationships that constitute the social world. Yet, in the case of Xiongnu tombs, funerary officiants make said ideologies work and manifest through bodily realities (relationships) beyond their control. Relational osteobiographies comprise things as they are – the bodies of humans and other animals as material, interrelational, and contextual – in conversation with things as they should be – the arguments, beguilements, and persuasions about those human and nonhuman bodies and their proper order. Thus, relational osteobiography aims to identify and interpret the inseparable intersection of lived social and material realities (born of complex interactions) and ideology animating ritual (discourse about how the social world, its inhabitants, and their relationships should be: Leach, 1954; Fowles, 2015) that comprise a multispecies mortuary assemblage.

Relational osteobiographies start at the scale of bodies – their parts and wholes – and their interrelationships. These bodies are always particular bodies in specific contexts, the remaining embodiments of lives, death, and beliefs at the core of a particular past social world. The relational osteobiographical approach to eight mortuary contexts where humans and five muzzled beasts were interred together at Elst Ar, a Xiongnu cemetery in Central Mongolia, facilitates interpretations of each multispecies assemblage as particular and relationally constituted. Working with the concept of living materiality as the co-constitutive, interrelational production of human and other animal bodies through their life-long, daily interactions, this project closely analyzes each constellation of humans and other animals as intentional associations of those bodies.

The empirical core of this project reconstitutes the intentional assemblages of humans and other animals from Xiongnu tombs and structures them as relational osteobiographies. This project builds on previous scholarship suggesting that mobile pastoralism and its constituent human-animal relationships play significant roles in Xiongnu political economy and imperial ideology through empirical examination of those relationships. The project assumes each Xiongnu tomb was a specific instantiation of a concept deeply significant in a past social world comprising and composed by relationships between humans and other animals: the Xiongnu cemetery at Elst Ar in Central Mongolia. The novel empirical data generated and analyzed in this project derive from an archaeological site in Central Mongolia (the Xiongnu cemetery at Elst Ar) within what archaeological evidence indicates was the cradle of the Xiongnu polity and remained the center of the greater Xiongnu imperial heartland (northern Central Mongolia). The project compiles eight relational osteobiographies of lived experiences and constructed relationships of a multispecies community in order to identify patterns (or lack thereof) in the human-animal relationships at Elst Ar that may indicate key dynamics at the heart of Xiongnu society.

1.6 Assembling The Pastoral Fold

What comparison of each relational osteobiography from the eight Xiongnu tombs at Elst Ar suggests is a twinned dynamic of fluidity and variation within set parameters of humans and herd animals assembled together. At Elst Ar living Xiongnu brought together specific people and particular livestock – horses, cattle, sheep, and/or goats – as part of mortuary ritual again and again. The result is eight multispecies mortuary assemblages that vary in the specifics (number of individuals, taxa present, ages at death, skeletal sex, paleopathological indicators of activities and health) but work within a common framework: the ‘raw materials’ of mobile pastoral lifeways (humans and herd animals). This observed variation indicates that, at Elst Ar, the production of multispecies mortuary assemblages was consistent with how mobile pastoral communities organize their multispecies members: as herds. The variable, fluid content of the multispecies assemblages from Elst Ar parallels the variable and fluid character of herds within mobile pastoral societies. Ethnographic accounts of multispecies herding communities in Mongolia and southern Siberia demonstrate that herds are far from static units. Their composition shifts along complicated intersections of temporality, ontogenetic development, and productive purpose. But to account for herd animals alone is to miss key members of mobile pastoral lifeways: the humans. Each iteration of the herd, each fluid assemblage of livestock taking shape at a specific moment, requires the human element of mobile pastoralism. Without herders, there are no herds. To consciously place people back into multispecies assemblages, I propose the *pastoral fold* in the place of ‘herd’.

I have extrapolated the pastoral fold as a concept or logic within Xiongnu society at Elst Ar from the eight relational osteobiographies, the iterations of which demonstrate values asserted and contested through mortuary ritual that are drawn from mobile pastoral lifeways. What each relational osteobiography interprets is a single iteration of the pastoral fold. Each iteration or performance of the pastoral fold is organized around particular kinds of human-herd animal relationships within a mobile pastoral lifeway that are embodied in these specific humans and herd animals from the perspective of the Xiongnu who assembled them together in a tomb.

I will argue that the pastoral fold represents a logic by which the Xiongnu at Elst Ar assembled and asserted a form of collective identity or subjectivity central to their social order and socio-cosmological commitments. The collective identity subscribed to and performed by this local Xiongnu community was multispecies, relational, and contextual. By pushing the empirical data for the pastoral fold's eight iterations at Elst Ar from interpretation to speculation, I conjecture about the ways in which the pastoral fold might have functioned as a biopolitical technique within the Xiongnu imperium.

Direct evidence for the ways in which the pastoral fold might intersect with other scales of Xiongnu politic life are thin on the ground at Elst Ar. But wandering into the realm of woolgathering I tentatively suggest that the pastoral fold may have been a method by which political communities coalesced in solidarity and scaled up into the Xiongnu imperial formation. This method would operate on the performance and assertation of "Xiongnu-ness", a citational practice (Butler, 1993) of bringing political subjectivity into being through material, interspecies relations. Such iterations of the pastoral fold and their biopolitical work would call up an alternative account of Xiongnu imperial ideology and political dynamics, wherein the constitution and contestation of subjectivity operated in the realm of mobile pastoral's beating heart. Compatible with but distinct from current theorizations of the vibrant, multiscalar political world of the Xiongnu Empire, the pastoral fold may offer an empirically grounded path from the bones up to the body-politic.

1.7 Organization of The Dissertation

Chapter 2 introduces the Xiongnu as the first imperial nomads of eastern Eurasia known from the historical record: the architects of a millennia-long tradition of mobile pastoral states and empires emerging in what is today Mongolia to conquer their neighbors, surrounding regions, or even the world (cf. Chinggis Khaan as the World-Conqueror). Texts written about the Xiongnu comprise the primary sources from which their history is drawn – texts produced by their greatest geopolitical rivals, imperial China. These written accounts articulate the Xiongnu as an object of analysis for the first time, and that articulation is bound up in the mobile pastoral character of the Xiongnu and their imperial formation. Moreover, some of these written records indicate that mobile pastoralism was essential to the Xiongnu's view of themselves: a shared mobile pastoral lifeway as a logic of political solidarity and subjectivity. That mobile pastoralism specifically centers on the complex, interdependent, long-term relationships between humans and their domesticated herd animals.

Chapter 3 transitions to the Xiongnu as an archaeological object of analysis, briefly recounting the history of Xiongnu archaeology around the theme of mobile pastoralism and the presence of nonhuman animals in Xiongnu contexts and material culture. Text-based understandings of the Xiongnu Empire as fundamentally mobile pastoral greatly shaped archaeological interpretations of the Xiongnu, and the earliest proto-archaeological investigations produced empirical support for those understanding in the form of livestock remains consistently interred in Xiongnu tombs across Mongolia and southern Siberia. Nonhuman animal bone, tooth, horncore, and antler join representations of real and imagined animals in Xiongnu material culture, evincing the polysemous, significant place of animals in the Xiongnu world. Although the excavation of mortuary contexts and the analysis of their contents have dominated Xiongnu archaeology, the discipline has expanded its métier to investigate the contexts of the living: habitation sites, production centers, settlements, and broader archaeological landscapes. Such work has generated novel datasets that complicate the perception that mobile pastoralism was the universal lifeway practiced in the Xiongnu Empire. Yet I argue that archaeological evidence confirms the prevalence of mobile pastoral practices in Xiongnu contexts of the living and the dead, and that the most direct evidence for the centrality of mobile pastoralism to the Xiongnu still comes to us from their tombs.

Chapter 4 focuses on the primary source of archaeological information about the Xiongnu: their tombs. This chapter considers the debate about whether the two main types of Xiongnu tomb – the 'modest' ring and 'ostentatious' monumental platform – both hold the bodily remains of imperial 'elites', and the transition in Xiongnu archaeology from reading these mortuary contexts as reflections of the sociopolitical hierarchy to analyzing the political dynamics enacted in their production. The project shifts perspective on the Xiongnu tomb yet again to highlight its inherently ideological, cosmological, and political character within imperial society. I argue that the Xiongnu tomb may be as near as archaeologists will ever come to an indigenous category or concept of the Xiongnu, and that close analysis of these tombs or their constituent materials can uncover potent values, logics, and beliefs that the Xiongnu enacted through mortuary ritual.

The constituent materials of greatest interest to this project are the human and other animal bodily remains deliberately assembled into Xiongnu tombs again and again across time and space. The nonhuman animal remains, particularly of the five muzzled beasts, have been analyzed and interpreted separately from the human remains with which they were interred. The ubiquity of livestock in the nonhuman animal materials in Xiongnu tombs represents an underexplored phenomenon argued to index the centrality of the pastoral to Xiongnu mortuary practice, imperial ideology, and society.

Chapter 5 delves into mobile pastoralism through ethnographic accounts of multispecies herding communities in present-day Mongolia and southern Siberia. These accounts together with veterinary information about the five muzzled beasts reveal mobile pastoralism to be a multispecies endeavor between herders and their herd animals. I argue that the bodily interactions between humans and livestock constitute the core of the multispecies relationships that sustain and define mobile pastoral lifeways, and that an ambivalent reciprocity, or asymmetrical interdependence (Peemot, 2017) characterizes the close, complex, long-term entanglements between herd animals and their herders.

Chapter 6 introduces two of the project's novel concepts in developing the analytical terrain toward an empirical investigation of Xiongnu human-animal relationships in life and death: living materiality and relational osteobiography. Living materiality is a theoretical framework that characterizes the relationships between humans and other animals as materially mediated. Relational osteobiography operationalizes living materiality by deploying existing methodologies from bioarchaeology and zooarchaeology to analyze bodily remains as enacting and coming into being through interspecies, material interactions.

Chapter 7 moves to the application of relational osteobiographical analysis to assemblages of human and domesticated herd animal remains from eight Xiongnu ring tombs at the Elst Ar cemetery in the Tuul River drainage basin of Central Mongolia. I used bioarchaeological and zooarchaeological methods on those osteological materials housed at the Ancient Technologies Research Center (ATRC) of the Mongolian University of Science & Technology (MUST/SHUTIS) in order to generate osteobiographical information: minimum number of individuals (MNI) by taxon or species; number of taxa present; age at death; skeletal sex; and paleopathological indicators of trauma, infection, and anomalous morphologies (see Appendices D-L). I then re-assembled the human and nonhuman animal remains from each tomb that had been separated during excavation and field analysis as living Xiongnu had placed them in death. Using relational osteobiographical analysis I interpreted each assemblage through the lens of human-animal relationships as lived experiences made material in once-living bodies and as relationships constructed in mortuary space by living Xiongnu.

The resulting eight relational osteobiographies comprise Chapter 8: narrative interpretations of the constellations of specific people and particular domesticated herd animals assembled by living Xiongnu in their tombs at Elst Ar. The eight relational osteobiographies differ in their details: how many people with how many and which kinds of livestock, who died at what age, and so forth. Logics or themes emerged from the Elst Ar relational osteobiographies, such as hard work, care, bodily transformation, expertise, and interdependence, but no logic or theme was universal. Rather, the empirically-grounded accounts of *Achigch*, *Akhmad*, *Bairtsgüi, Dog' Tolgoi, Khaikhramj, Khos, Mal Tuugch,* and *Saakhalt* evoke performances, declarations, or enactments of specific kinds of relationships between herders and herd animals.

Chapter 9 compares the eight Elst Ar relational osteobiographies with the aim of identifying a formula or set of rules that guided the assemblings of humans and livestock at the core of Xiongnu mortuary practice. Yet no formula or recipe emerged in the course of comparison. Instead, the living Xiongnu varied their acts of assemblage within the set parameters of mobile pastoralism: herders and herd animals together. Therefore, the Xiongnu production of multispecies mortuary assemblages – bringing humans and herd animals together again and again into multispecies assemblages, but varying the specifics of those humans and herd animals – reflects how mobile pastoral communities organize their members. The Elst Ar assemblages are reminiscent of herds, which are variable, fluid, and contextual constellations of domesticated herd animals. But because there are no herds without herders and because people populated each assemblage at Elst Ar, humans must be folded back into this multispecies mobile pastoral collective. Here Chapter 9 discusses the project's third novel concept – the pastoral fold – to describe what the living Xiongnu were assembling in each tomb at Elst Ar. Each multispecies mortuary assemblage is thus an iteration of the pastoral fold organized around particular kinds of multispecies entanglements (specifically human-herd animal relationships) within mobile pastoral lifeways embodied in these specific humans and herd animals from the perspective of the Xiongnu who assembled them.

I argue that the pastoral fold represents a logic by which a local Xiongnu community assembled and asserted a subjectivity central to their social world that was multispecies, relational, and contextual. I suggest that inclusion in an iteration of the pastoral fold was a core component of performing "Xiongnu-ness", a political subjectivity firmly rooted in mobile pastoral beliefs and values. Here and in Chapter 10 I speculate on broader implications of the pastoral fold as a biopolitical technique at play within the Xiongnu Empire, including that it may have been a method by which political communities united and ‘scaled up’ into the imperial project known as the Xiongnu Empire. Chapter 10 closes the project by looking back along the discursive path tread from the Xiongnu’s introduction to the ramifications of the pastoral, and by woolgathering on what analysis from the bones up can offer the archaeological imagination.

CHAPTER 2

HISTORIES OF THE FIRST IMPERIAL NOMADS

2.1 Introducing The Xiongnu

At the end of the Late Iron Age, mobile pastoral communities of the eastern Eurasian steppe organized into the Xiongnu Empire, the original great steppe empire of a long series of regimes that have transformed Eurasia over the past two millennia (Ban Gu; Fan Ye; Sima Qian; Di Cosmo, 1994, 1999; Regzen and Batbold, 2007; Barfield, 2011; Rogers, 2012). Historian Nicola Di Cosmo encapsulates the global-historical importance of their empire when he writes that “the Xiongnu played the special historical role of being the first empire formed to the north of China, and, as such, the precursor of many other nomadic empires (Turks, Uighur, Khitan, Jurchen, and especially Mongol), achieving distinction, if not always appreciation, in the historical records of Eurasian civilizations” (2013). The Xiongnu thus stand as the earliest imperial and empirical challenge to longstanding anthropological and social theoretical precepts about the inherent limitations that mobile pastoral lifeways place on a society’s capacity for political complexity.

Figure 2.1 Map of Northern and Inner Asia centered on Mongolia (from Honeychurch, 2015).

At its greatest geographical extent, the Xiongnu Empire spanned all of Mongolia, and much of southern Siberia (Tuva, Cisbaikalia, and Transbaikalia), Manchuria, Inner Mongolia, Xinjiang/East Turkestan, and into eastern Kazakhstan (Batsaikhan, 2003; Honeychurch, 2015). These first imperial nomads emerged from deeper traditions of increasing political complexity among mobile pastoral communities and polities comprised of herders and their mixed herds of sheep, goats, horses, cattle, and perhaps Bactrian camels that populated a diversity of ecological settings across eastern Inner Asia (Benecke, 2003; Anthony, 2007; Frachetti and Benecke, 2009; Houle, 2010; Haruda, 2018; Jia et al., 2017, 2018; Jeong et al., 2018; Orlando, 2018; Taylor et al., 2020). Modern scholarly understanding of the Xiongnu arises from the contested intersections of historical documents produced about the non-literate Xiongnu by their sedentary neighbors and geopolitical rivals in imperial China (and their descendants), and the archaeological record of Mongolia and surrounding environs in northern China and southern Siberia (consisting predominately of mortuary contexts: Dorjsüren, 1961; Batsaikhan, 2003; Törbat[5], 2004; Honeychurch and Amartuvshin, 2006; Miller, 2009; Minyaev, 2009; Honeychurch, 2015). The distinct objects of analysis and methodologies of historical and archaeological inquiry yield two distinct yet overlapping timeframes for the Xiongnu Empire: 209 BCE to 93 CE (or 91 CE: Atwood, 2004), and as early as 400/300 BCE to as late as 200 CE, respectively (Honeychurch, 2015). Moreover, recent research into the Xiongnu archaeological record indicates a transformation or major shift within imperial mortuary practice not reflected in the textual record (Brosseder, 2009; Di Cosmo, 2013).

Even after more than a century of archaeological investigation and two millennia of historical analysis, many aspects of the Xiongnu Empire remain opaque. This project engages with scholarly discourse about the role and significance of mobile pastoralism to our understanding of the Xiongnu Empire to make three main arguments. First, that those studying or engaging with the Xiongnu found mobile pastoralism as a lifeway to be constitutive of the Xiongnu Empire as an object of analysis. Second, that the Xiongnu as a nomadic or steppe empire confirm more recent trends in political anthropology and archaeologies of mobility and mobile pastoralism that refute notions that nomadic or mobile pastoral polities, especially states and empires, only result from external forces because of an inherent limit placed on their capacity for political complexity. Third, that a closer examination of the 'pastoral' component of Xiongnu mobile pastoralism is likely to yield novel interpretations or richer portraits of Xiongnu imperial society.

[5] 'Torbat', 'Turbat', and 'Törbat' are all extant Latin transcriptions of the Mongolian archaeologist Ц. Төрбат's name. I use 'Törbat' when transcribing Төрбат from Cyrillic directly (see References, Appendix A).

The disparate temporal framing of the Xiongnu and the mismatches between material and written records encapsulate the contested, uneasy relationship between historians and archaeologists studying the Xiongnu, and between historical and archaeological knowledge production more generally (Di Cosimo, 2013; Honeychurch, 2015; Chernykh, 2017). Yet both the textual evidence and material record share a fundamental view on the Xiongnu. What we know (or think we know) about the Xiongnu from both historical and archaeological perspectives rests upon their political economy and way of life: mobile pastoralism[6]. This chapter presents a case for viewing mobile pastoralism (or mobile pastoral lifeways) as fundamental to how the Xiongnu and their empire are constituted as objects of analysis across millennia of discourse. The constitutive role that mobile pastoralism has played in characterizing the Xiongnu by outside contemporaries and later scholars manifests in historical texts produced in what is now China and in decades of archaeological investigation into the Xiongnu. By teasing out this connective tissue threading through discourse about the Xiongnu and their empire, we create an opportunity to reconsider the analytical value of mobile pastoralism to our understanding of the first imperial nomads.

Bringing inquiry of the Xiongnu back to this fundamental starting point prompts consideration of what mobile pastoral lifeways meant to the Xiongnu themselves. Key here is the long-noted phenomenon of nonhuman animals (notably domesticated herd animals or livestock) intentionally buried in Xiongnu tombs, which previous scholars posit reflects the significance of the 'pastoral' component of mobile pastoralism in Xiongnu society. This under-

[6]Not all Xiongnu were exclusively mobile pastoralists (see Di Cosimo, 2002). Archaeological evidence points to a diversity of lifeways and modes of production within the empire (Honeychurch, 2015), particularly as it expanded to conquer and incorporate sedentary and/or agricultural populations in Xinjiang/East Turkestan. Rather, mobile pastoralism appears to have been a consistent, widespread way of life within the Xiongnu Empire practiced primarily or sporadically by communities across the political hierarchy and polity's temporo-geographic span.

explored phenomenon affords an opportunity to investigate why the Xiongnu drew elements of mobile pastoralism into their mortuary practice and what that might indicate about their societal values and imperial ideologies. By emphasizing the constitutive power of mobile pastoralism in articulating the Xiongnu as an object of analysis across millennia and epistemes, this chapter lays out key works in those regimes of knowledge production that continue to shape our understanding of the Xiongnu. Moreover, this project builds on that tradition by positing that mobile pastoralism has not only been foundational to external understandings of the Xiongnu, but that the Xiongnu themselves may have considered mobile pastoralism foundational in their own beliefs, subjectivities, and values.

2.2 Introducing Xiongnu Mobile Pastoralism

Mobile pastoralism and its related practices and materials permeate the Xiongnu as an object of analysis. Viewed from the outside, the Xiongnu are inseparable from their mobile pastoral way of life. Both historical and archaeological inquiry into the Xiongnu assume a pastoral dimension to these peoples and their empire, and implicitly or explicitly convey that assumption. The Xiongnu as outsiders and Others constituted in Han historical records draws heavily on their alien way of life: nomadic, mobile pastoral, wandering with their herds, and so forth. Details of (mobile) pastoral life pepper the core primary texts written about the Xiongnu, their history, and their political relevance to the Han. When the earliest archaeological inquiry into Xiongnu contexts began in the late 19th century, their nomadic and/or pastoral practices were essential to how the peoples who built the tombs appeared in the archaeological imagination. The consistent and intentional association of domesticated herd animals with humans in mortuary spaces, deposits of said animals in ritual contexts, zooarchaeological datasets from ephemeral habitation sites (often interpreted as seasonal encampments), site distribution data, and an abundance of Xiongnu material culture fashioned out of animal materials, depicting animals, or for use on domesticated animals (notably equipage, or horse riding and management equipment) have been used as evidence that the Xiongnu were mobile pastoralists.

The consistent and intentional association of domesticated herd animals with humans in Xiongnu mortuary space is a key finding of Xiongnu archaeology upon which this project is based. Previous scholars have noted the regular, deliberate domesticated herd animal presence in Xiongnu mortuary space; the archaeologist Bryan Miller and his colleagues argue that "[d]espite the centrality of animal remains in Xiongnu mortuary practices, the spectrum of offerings (numbers, taxa, post-mortem treatment) interred in these complexes constitutes one of the greatest—yet least explored—demonstrations of social politics" (Miller et al., 2018: 1312-1313). Domesticated herd animals (along with other nonhuman animals) recovered from Xiongnu mortuary contexts thus represent a promising and underutilized aspect of archaeological inquiry into the Xiongnu and their empire. More broadly, these domesticated herd animals are representatives of the five muzzled beasts and their presence strongly indicates a link to mobile pastoralism. Beyond their crucial roles in subsistence and pastoral production, the importance of livestock in Xiongnu society "appears to have been reflected in Xiongnu burial practices: domestic animals were also routinely deposited as funerary offerings in Xiongnu graves and monumental complexes, suggesting that herd animals were deeply embedded components of Xiongnu identity and belief systems." (Makarewicz, 2011: 28)

Xiongnu mortuary contexts thus contain empirical evidence consistent with a strong (mobile) pastoral dimension of political economy and way of life within the empire. These datasets also indicate that mobile pastoralism and the herd animals that comprise its core pervaded the Xiongnu world beyond subsistence, daily life, and political economy. Following the insights of Miller and colleagues (2018), domesticated herd animals were used to enact the ideologies central to Xiongnu mortuary practice. This phenomenon suggests that these animals and the mobile pastoral lifeways they enabled held tremendous symbolic and cosmological significance for the Xiongnu. Said implications of the consistent presence of domesticated herd animals in Xiongnu mortuary space dovetail with a reworked vision of mobile pastoralism seen in social zooarchaeology and multispecies ethnography (see Chapter 5). A similar reorientation of mobile pastoralism as concept and analytic appears within archaeology, notably the archaeology of Inner Asia and Mongolia in particular (Frachetti, 2012; Honeychurch, 2014; Honeychurch and Makarewicz, 2016), and is exemplified in William Honeychurch's *Inner Asia and the Spatial Politics of Empire: Archaeology, Mobility, and Culture Contact* (2015).

In this monograph, Honeychurch synthesizes a number of insights from these overlapping revisitations of mobile pastoralism as a mode of economic production or environmental adaptation to suggest a different understanding of mobile pastoral lifeways. Mobile pastoralism (pastoral nomadism), he argues, has been mischaracterized as "a static condition, a mode of production, or an economic type" (Honeychurch, 2015: 57) in much anthropological, archaeological, and historical knowledge production. It is in fact a vibrant, dynamic way of life with diverse expressions across time and space, "a flexible strategy enabled by co-community with herd animals and the cultural embedding of mobility" (Honeychurch, 2015: 12).

To elaborate upon this idea, Honeychurch then separates the pastoral from mobility, positioning these human-animal relationships as fundamental, and modified and shaped (rather than constituted) by mobile practices. He argues that, "[f]ar from being synonymous with food economics or an essentialized type of society, pastoralism is a lifeway and ideology having many expressions, but principally derived from the cultural knowledge needed to sustain relationships of co-community with animals by way of relationships within and among human groups" (2015: 57). Pastoral lifeways become mobile pastoral ones "when the capacity for residential mobility is critical to mediating a regime of human–animal and human–human relationships over time" (ibid). The great variation observed in mobile pastoralism thus results from the interplay between mobility and the relations of "co-community" between humans and herd animals it facilitates.

What Honeychurch crafts is a "version of pastoral nomadism…quite different from that of herd economics and ecology which to date has guided much archaeological research" (2015: 57), a perspectival shift prioritizing "culture, social relations, and ideology" in the archaeological imagination of "pastoral nomadic prehistories" (ibid). Honeychurch thus argues that if archaeologists recognize that the dynamic, long-term relationships between humans and their herd animals form the heart of mobile pastoralism, then archaeologists can investigate the ways in which those relationships permeate and shape the ideological, social, and political spheres of those past societies. This orientation enables archaeologists to open up past complexities that have been elided by a fixation on subsistence, ecological adaptation, and political economy that define a static type. Following Honeychurch's lead, this project characterizes mobile pastoralism as a multispecies endeavor (see Chapter 5) to emphasize the centrality of human-animal (human-herd animal) relationships across social, economic, and ideological spheres of Xiongnu imperial society.

This project operates primarily in the realm of archaeological analysis, but pre-existing conceptions of the Xiongnu deriving from Chinese (primarily Han dynastic) texts greatly influenced the archaeology of the Xiongnu Empire. Historical inquiry into the Xiongnu began long before the first archaeological investigations of contexts and materials that would comprise the Xiongnu as an archaeological object of analysis. The historical narrative as constructed from Chinese textual sources speaks to the mobile pastoral elements and dynamics within the Xiongnu Empire. A mobile pastoral way of life was fundamental to scholarly interpretations of the Xiongnu during the Han dynasty's long, tumultuous history. The legacy of this characterization of the Xiongnu over the intervening millennia across disciplines and languages cannot be overestimated.

In the subsequent section, I use these texts to demonstrate two points. First, that to consider and understand the Xiongnu Empire is to see herders with their herds. Second, that the Xiongnu Empire as herders together with their herds is a framing with both historical depth and continued relevance, as it shapes scholarly analysis and imagination to this day.

2.3 "Their Inborn Nature": Xiongnu Mobile Pastoralism in Historical Sources

> "They move about in search of water and pasture and have no walled cities or fixed dwellings. Nor do they engage in any kind of agriculture…It is their custom to herd their flocks in times of peace and make their living by hunting, but in periods of crisis they take up arms and go off on plundering and marauding expeditions. *This seems to be their inborn nature*…Their only concern is self-advantage, and they know nothing of propriety or righteousness"

- *Shi ji* 110, 1: The Account of the Xiongnu (Sima Qian's "Records of the Grand Historian"; emphasis author's: Watson, 1993)

Sima Qian (145-87 BCE) was an eminent historian and political figure of the Han dynasty who crafted a vision of the Xiongnu as inherently and essentially Other: "[t]his seems to be their inborn nature". Sima Qian's passage exemplifies three levels at which mobile pastoralism is bound up in the Xiongnu as an object of analysis. First, it argues that the Xiongnu lead a mobile pastoral way of life, supplemented with hunting and plundering, in implied contrast to settled agriculture, craft production, and trade as political economic modes befitting a 'civilized' society. Second, in the above passage, Sima Qian asserts that the mobile pastoral way of life is essential to (Han) understanding of the Xiongnu as an entity, object of analysis, and threat or rival. Third, it essentializes the Xiongnu on these bases in order to construct a constitutive Other, an alien outsider against whom the Han Empire must struggle and can come to constitute and understand itself. Sima Qian's characterization of the Xiongnu embodies the challenge of using Han sources to study the Xiongnu: those who produced these texts and ideas about the Xiongnu worked with an agenda and viewed the Xiongnu from the outside looking in.

Scholars first articulated the Xiongnu as an object of analysis in texts produced by during the Han dynasty of imperial China. The three most important primary sources on the Xiongnu Empire are Sima Qian's *Shi ji* (*Record of the Grand Historian*; approx. 100 BCE: Honeychurch, 2015), Ban Gu's *Han shu* (*Book of Han*; approx. 36-116 CE: Honeychurch, 2015), and Fan Ye's (398-445 CE: Miller, 2014) *Hou han shu (Book of the Later Han)*[7]. Thus, all three of these key

[7]See Miller (2009) for a discussion of the provenance and production of these three texts, along with a fourth text relevant to Han imperial views of and relationships with the Xiongnu, *Yan tie lun (*鹽鉄論 : *Debates on Salt and Iron*).

historical texts written about the Xiongnu were produced at least a century after the purported foundation of the empire in 209 BCE. Han dynastic historical sources reference Xiongnu attacks that occurred during the Warring States period (476-221 BCE) and subsequent Qin dynasty (221-206 BCE). Thus, Han scholars were not only 'looking from the outside in'; they were looking back in time at the Xiongnu.

As of this writing, no indigenously-produced Xiongnu texts have been recovered. No clear empirical evidence for Xiongnu writing or script yet exists, despite over a century of archaeological research (but see Batsaikhan, 2003, for a counterargument). Historians, philologists, and other scholars thus based their interpretations and analyses of the Xiongnu entirely on texts written by the empire's primary geopolitical rival, Han imperial China. While these texts provide invaluable information about the Xiongnu Empire, it is important to critically assess the context and limitations of the textual record, and to contend with the uneasy relationship between textual and archaeological evidence. As archaeologist William Honeychurch points out, "[t]he search for evidence about the Xiongnu state traditionally has taken researchers to textual records; however, such evidence is not without its own unique problems. Both the corpus of documents and controversies over ways to combine the textual and material records continue to pose conceptual and methodological problems for archaeologists working on Xiongnu statehood" (Honeychurch, 2015: 222).

The term 'Xiongnu' itself indexes the historiographical view of the Xiongnu from outside. 'Xiongnu' or " 'Xiōngnú' 匈奴 was in some sense a self-designation of the Xiōngnú" as evidenced by its appearance in "letters sent by the court of the Darqa[8] (i.e., the Xiōngnú emperor) to the emperor of China. Such letters were written in Chinese" (Atwood, 2015b: 39).

[8]Title of the Xiongnu supreme ruler or emperor reconstructed by Atwood. See *shanyu* in subsequent passages.

Current historical linguistic research suggests that 'Xiong' is a cognate for both 'Hun' and 'Khion', terms associated with groups in Europe, Central Asia, and India several centuries after the collapse of the Xiongnu Empire (Atwood, 2004); the second syllable, 'nu', is a pejorative: 'slave' (ibid). Even in their name, the Xiongnu exist primarily in relation to others. The term 'Xiongnu' links to possible descendants who are better known from a wider array of later written histories (e.g., the Huns, the Hephthalites), and/or to their geo-political rivals and their successors (e.g., Han imperial China). The plethora of modern terms for the historical and archaeological object of analysis signals another dimension of political and ideological complexity. Today, 'Xiongnu', 'Hsiung-nu' (Chinese in Wade-Giles transcription), 匈奴 (Simplified Chinese), 'Khünnü' (Mongolian: Хүнну / Khünnü / Hünnü), and 'Khunnu' (Russian: Хунну / Khunnu / Hunnu; sometimes Syounnu / Сюнну) are all commonly used to refer to the same object of analysis.

A divide roughly separates Russian/Soviet and Mongolian linguistic practice (Khunnu, Khünnü) from Chinese, French, and English (Xiongnu, Hsiongnu) in referring to this object of analysis. The first practice self-consciously gestures at the Xiongnu on their own terms and in connection to later Turkic, Hunnic, and/or Eurasian steppe nomadic descendants. The second practice borrows its terminology from Chinese historical texts. This dichotomy holds latent political salience vis-à-vis the relationships actively constructed between present peoples (archaeologists, local populations, nation-states) and an archaeological object of analysis. In particular, the Mongolian term reflects the Mongolian nationalist and ethnic history-making projects that locate the origin of the Mongolian people and the Mongolian state in the Xiongnu and their empire. In contrast, the term 'Xiongnu' accords with the Chinese characterization of an archaeological or historical object of analysis untethered from modern peoples or political projects in China.

To what kind of entity, then, does 'Xiongnu' refer? This project follows multidisciplinary scholarship that characterizes 'Xiongnu' as political in nature rather than ethnic or linguistic. For the archaeologist Ursula Brosseder, 'Xiongnu' is a sociopolitical category, because "[t]he label of Xiongnu does not denote a coherent entity of people with the same language or the same ethnic affiliation. Rather, it refers to numerous peoples or tribes within a political confederation and designates a political entity of groups from distinct regions, with various cultural and social regimes, across a broad territory via a formalized integrative imperial system. Because of this more sociopolitical meaning, there is no straightforward answer to the question of the origins of the phenomenon known as the Xiongnu" (2020: 197). Brosseder's view of 'Xiongnu' as sociopolitical broadly aligns with that of historians who infer from the textual record that 'Xiongnu' was a political category or designation (Goldin, 2011; Atwood, 2015b). Goldin points out that when scholars, particularly archaeologists, seek the Xiongnu prior to the emergence of the empire (heralded by the rise of Modun/Maodun in 209 BCE) they are making "a category mistake. From the beginning, the semantic domain of the term "Xiongnu" was political: there is no reason to assume that it ever denoted a specific ethnic group—and, indeed, plenty of reason not to" (2011: 227). Atwood delves further into this argument, teasing out the specific nature of 'Xiongnu' as a political designation within the broader imperial traditions of Inner Asia into the 20th century (2015b). 'Xiongnu', he argues, was an imperial dynastonym[9], or the name used to

[9]As opposed to a political designation, the broad ethnic term or ethnonym within the Xiongnu Empire was 'Hu'. 'Hu' was in use prior to the foundation of the Xiongnu Empire and its deployment in tandem with an imperial dynastonym like Xiongnu aligns with self-designatory systems of Inner Asian empires from the post-Xiongnu era into the 20th century (Atwood 2015b).

refer to the Xiongnu imperial formation, and thus analogous to the 'Yuan' of the Mongol-ruled Yuan dynasty or the Manchu-ruled Qing dynasty of China (ibid: 36-39).

Crucial is that "[t]he term 'Xiongnu' is never attested in Chinese document [sic] written before the reign of Modun, the first great Xiongnu Darqa [*shanyu*]" (ibid: 39). Although Chinese texts produced during the Han dynasty (206 BCE - 220 CE) reference Xiongnu attacks during the preceding Warring States period, "all references to the Xiongnu…appear in texts from the Han dynasty or later" (Goldin, 2011: 226). The historical evidence thus indicates that 'Xiongnu' as a term coincides with the emergence of the Xiongnu Empire, rather than with the ethnic group or groups who comprised the Xiongnu Empire. Thus, 'Xiongnu' should be understood as a political category, from which it follows that investigating the Xiongnu is to examine a political subjectivity. Emergent in this framing are questions of the nature of Xiongnu political subjectivity, including what kinds of beliefs and values were deployed, negotiated, and subverted to assert and propagate it.

2.4 An Overview of The Xiongnu as Portrayed in Han Primary Sources

The Xiongnu first appear in early imperial Chinese records as a rising power on the northern frontier (northern China and parts of Inner Mongolia) with a 209 BCE consolidation of power after Qin imperial forces invaded these territories of myriad mobile pastoral communities (Qin dynasty: 221-206 BCE). These texts allude to a Xiongnu political community before Modun (also Modu or Maodun, reigned 209-174 BCE), the first imperial supreme leader (*chanyu* or *shanyu*) who violently overthrew his father, his step-relatives, and his father's political inner circle in 209 BCE (*Shiji*: Sima Qian [Watson, 1993]; *Han shu*: Ban Gu [Wylie, 1894; Parker, 1892-1893]; Di Cosmo, 2013). Historian Nicola Di Cosmo convincingly argues that Modun usurped power within an established political system. Of Modun's foundation of the Xiongnu Empire, Di Cosmo writes that, "if we can speak of a qualitative leap, this should be seen primarily in terms of the growth of the Xiongnu empire, and of the reordering of the internal hierarchies and power relations within the newly conquered lands. At the level of the *chanyu* court and state command structure, the political order changed in the sense that a new, highly centralized political elite came to power, but this new order was built upon a pre-existing system of government that used to function on a smaller and possibly more flexible scale, then remapped on a much larger scale to fit the needs of an expansive empire" (2013: 30). Under Modun's leadership the Xiongnu pass a critical threshold for the Qin and Han (202 BCE - 220 CE)[10] dynasties that marks them as fundamentally other and frustratingly recalcitrant to 'Chinese' civilization (*Shi ji*: Sima Qian [Watson, 1993]; Goldin, 2011).

What was the political order that Modun scaled up from earlier systems of authority and administration into the first imperial polity of eastern Eurasian nomads? The Chinese historical texts indicate that the Xiongnu Empire "was ruled by an aristocracy of three noble families who governed their subjects using a military-civil administrative system of decimal units. These characteristics – aristocracy and decimal military-civil administrative units – persistently appear in steppe societies until the twentieth century" (Sneath, 2007: 3), and combine with other "techniques and institutions of governance that were parts of a distinctive steppe tradition" (ibid, 178) encompassing the imperial polities of eastern Eurasian and Inner Asian nomads into the 20th century. One such institution first developed by the Xiongnu and seen in some descendant steppe empires is the tripartite division of imperial territory, with the central authority (in this

[10]Periodization and details of the Han dynasty are beyond the scope of this project.

case, the *shanyu* or emperor) ruling from the geographic center and two viceroys directly under that authority ruling the left and right (east and west, respectively) 'wings' of the empire (Atwood, 2004; Honeychurch, 2015; Rogers, 2015). The lands of the *shanyu*'s court, the Left Worthy Prince, and the Right Worthy Prince were further subdivided into the domains of 'lesser' kings, princes, and governing officials; the historian Lin Gan characterizes all these administrative divisions as stationed herding areas for these strata of imperial rulers (2020).

Other methods and institutions that round out the steppe tradition of statecraft and were first documented among the Xiongnu include: an imperial ruler's mandate from heaven ordaining their sovereignty, an aristocratic system of political governance, (Sneath, 2007: 178-179), "an elaborated ideology of leadership, politically symbolic public ceremony, lifeway advantages for commoners, and spatial politics as a state idiom for both exerting and resisting authority" (Honeychurch, 2015: 72). To these general principles scholars have added some detail of imperial structure and sociopolitical organization from textual sources concerned with the Xiongnu.

Of the three most significant Chinese texts about the Xiongnu, it is from Sima Qian's *Shi ji* that many latter scholars have reconstructed the empire's political organization (Sneath, 2007; Miller, 2014; Honeychurch, 2015). Chapter 110 of the *Shi ji* describes "the Xiongnu state as a large-scale, socially stratified, and centrally integrated organization…led by a hereditary elite that consisted of a single ruling house and three consort clans that provided senior marriage partners to members of the ruling house" (Honeychurch, 2015: 224). This aristocratic quartet solely populated the state's "highest political offices, which combined political authority, divine right, military leadership, and elite endogamy", and comprised the highest stratum of imperial society (ibid). In the *Shi ji*, Sima Qian included details of "a great many offices that supported rulership as well as a military-administrative decimal system of positions based on the number of horsemen a leader was responsible to mobilize, e.g., 10, 100, 1,000, or 10,000, although there is some debate over the specificity of these actual counts (Kradin, 2001: 208)" (ibid). . Articulated thusly, the decimal organization of Xiongnu society presents as primarily military in nature; however, "[t]here is no indication that this decimal organization was an exclusively military system, and Grousset (1970, 21) concludes that the entire nation was permanently organized as an army, even in peace" (Sneath, 2007: 114-115).

The roles and existence of kinship and tribal organization within Xiongnu society and empire remain highly contested by archaeologists and historians (Dorjsüren, 1961; Navaan, 1975; Kradin, 2002; Sneath, 2007; Brosseder, 2009; Kradin and Skrynnikova, 2009; Honeychurch, 2015; Rogers, 2015). In the *Shi ji*, Sima Qian is clear that descent and affiliation were important in the upper echelons of the Xiongnu Empire. "The high ministerial offices are hereditary, being filled from generation to generation by the members of the Huyan and Lan families, and in more recent times by the Xubu family. These three families constitute the aristocracy of the nation" (Watson, 1993, Book 110, Section 3b). But the significance or even existence of kinship systems below these elite strata of imperial society is contradicted by Sima Qian, who asserts that the Xiongnu as a people "have no family names or polite names but only personal names" (Watson 1993, Book 110, Section 1). From this evidence in the *Shi ji* David Sneath argues that "the baseline Xiongnu cultural practice was not to have clan or descent group names, except in the case of the aristocracy…[and] even these aristocratic houses do not seem to have been strictly patrilineal in the tracing of descent" (2007: 115-116).

After Modun's political consolidation, once this system of imperial organization and rule was in operation, the Xiongnu waged successful military campaigns against many of their neighbors, conquering and incorporating numerous polities as far west as the Tarim Basin of modern-day Xinjiang/East Turkestan (Sima Qian [Watson, 1993]; Kessler, 1993). One of Modun's greatest geopolitical triumphs was the Han Empire's adoption of *heqin* (sometimes *ho-ch'in*), or 'appeasement' policy, towards the Xiongnu Empire. Material concessions to the Xiongnu included tribute and Han princesses to be sent to the Xiongnu; moreover, the policy granted official recognition of the Xiongnu empire's status as the Han's equal. "Although based in part on older conceptions of foreign policy, the tributary relationship established between China and the nomads under the aegis of *ho-ch'in* was a new development in Chinese theories of foreign policy", argues Nicola Di Cosmo in his discussion of the *heqin* policy in *Ancient China and Its Enemies*. "This policy deviated dramatically from previous rubrics in that it was no longer pursuant of a project of expansion (by incorporating foreigners) or strengthening (by using foreigners as resources or allies) of the state. It was instead a defensive stance" (2002: 162-163). How the Xiongnu represented a novel threat to the Han imperial order in contrast to previous 'barbarian' peoples beyond the frontiers, as exemplified in the *heqin* policy, will re-emerge later in this chapter. The great Han emperor Wu Di broke the *heqin* with the Xiongnu in 134 BCE, instigating renewed geopolitical hostilities between the two empires where Han military campaigns went on the offensive in the west (Gansu and Tarim Basin) for decades.

Under successive *shanyu* (or *chanyu*, the title of the Xiongnu imperial hereditary supreme ruler: Sima Qian [Watson, 1993]; Ban Gu [Wylie, 1894; Parker, 1892-1893]), the Xiongnu engaged in intermittent border skirmishes and raids with the Han, primarily capturing people and animals rather than commodities. Internal power struggles, perhaps influenced by the end of the prestigious and beneficial *heqin* tribute system, plagued the Xiongnu Empire starting around 126 BCE. Facing an aggressive Han military and attacked by neighboring nomadic groups, the

Xiongnu Empire fractured into five subgroups after 71 BCE. The remaining Xiongnu factions would assimilate into the Han empire and relocate to Inner Mongolia, regroup in the imperial homeland in northern Central Mongolia and adjacent regions in Transbaikalia, or migrate out of the Han political sphere over subsequent decades.

The Xiongnu re-emerged and reunified under the leadership of the *shanyu* Hudu'ershi (19-46 CE) as a serious political power and rival to the Han, only for the Xiongnu Empire to split into the Southern and Northern Xiongnu in 53 CE after his death. The Southern Xiongnu pledged vassalage to the Han Empire, while the Northern Xiongnu retrenched in Xinjiang/East Turkestan, Gansu, and Mongolia in the face of renewed Han military aggression. The Xiongnu who did not pledge vassalage to the Han in 53 CE either migrated out of the Han sphere of interest or were defeated by the Xianbei (Xianbi, Sian Pei: a mobile pastoral group who became the geopolitical successors of the Xiongnu) in 87 CE. Han armies drove the remaining Northern Xiongnu into the Ili Valley of Kazakhstan in 91 CE, where they would deal the Northern Xiongnu a decisive and final defeat in 127 CE. According to Chinese textual records, descendants of the Xiongnu who submitted to Han imperial rule and settled within the empire would persist for some time as minor vassals, incorporated populations, and political malcontents after their empire's collapse.

Indeed, David Sneath argues that scholars should understand these major migrations of the Xiongnu as the movement of sovereigns and ruling elites in the context of Inner Asia and eastern Eurasian political history, where these elites were often much more mobile than those who they ruled (2007: 165). As he points out, "the Chinese sources make it clear that many of the inhabitants of the formerly Xiongnu territories took on the political identity of their new rulers" and that a changing of the elite 'guard' meant that "if there ever was anything like a Xiongnu *volk* it was not displaced by another such body" (Sneath, 2007: 165). Yet as an imperial power the Xiongnu were finished even if the people themselves endured under another name. In their wake, the Mongolian Plateau would see subsequent rises of imperial nomads who, along with their successors, would dominate Eurasian history into the 20th century.

2.5 Visions of Xiongnu Mobile Pastoralism in Han Primary Sources

Scholars of the Xiongnu Empire worked exclusively with textual evidence until the advent of Xiongnu archaeology (discussed below). The *Shi ji*, *Han shu*, and *Hou han shu* were the primary sources from which the historical narrative of the Xiongnu was constructed for over a millennium. These three textual sources suggest a political and historical context from which the Xiongnu Empire arose among myriad jockeying polities north of the Chinese imperial project's shifting borders. The history of the major political transformations in Late Bronze Age through Late Iron Age north and central China are beyond the scope of this project. However, the Xiongnu Empire was contemporaneous with several different Chinese dynasties and empires, which undermines the sense of political stability and uniformity in both the Xiongnu and Han/Chinese polities conveyed in these key texts (for further discussion, see: Kessler, 1993; Atwood, 2004; Honeychurch, 2015). The *Shi ji*, *Han shu*, and *Hou han shu* directly discuss or allude to the mobile pastoral practices of the Xiongnu, specifically their domesticated herd animals and their movements of peoples and animals to different pastures across the steppe. Moreover, these historical documents explicitly detail Xiongnu concerns over the living resources at the heart of mobile pastoralism – humans and their herds – in the arena of interpolity interaction (Schaberg, 1999).

From the earliest days of the Xiongnu rise to geopolitical prominence, capturing and incorporating both people and animals from raided or vanquished foes was a core strategy of expanding and strengthening the empire. The Han dynastic historian Ban Gu (died 92 CE) noted in the *Han shu* [Wylie, 1894; Parker, 1892-1893] that the founder of the Xiongnu Empire, Modun, marked his earliest victories as *shanyu* of the Xiongnu by capturing and incorporating subjects and herds from the vanquished Tungus, and subsequent *shanyu* and Xiongnu leaders perpetuated this strategy. Xiongnu imperialism in the historical texts regularly concerned itself with acquiring and integrating the humans and herds to expand the body-politic of their mobile pastoral society. The Xiongnu focus on humans and animals together in its imperial geopolitical practices suggests that humans and herds together were fundamental to the Xiongnu Empire, which would be consistent with a mobile pastoral political economy and lifeway.

A historical spokesperson for the centrality of mobile pastoralism to the Xiongnu Empire as a polis/imperium makes his case in both Sima Qian's *Shi ji* (Watson, 1993) and Ban Gu's *Han shu* (Wylie, 1894; Parker, 1892-1893): Chung-hang Yüeh (sometimes "Zhonghang Yue"). Chung-hang Yüeh was a eunuch sent to accompany a Han princess sent in marriage to the second Xiongnu *shanyu*. Angered at his effective banishment from the Han empire, Chung-hang Yüeh made good on a threat made to the Han emperor that, should he be sent to the Xiongnu, he would aid them against the Han.

Figure 2.2 "Wang Zhaojun entering the desert" by Qiu Ying, Ming dynasty painter. Wang Zhaojun was a Han imperial concubine sent by the emperor to marry the Xiongnu *shanyu* Huhanye (reigned 59–31 BCE).

In the *Shi ji*, Sima Qian uses Chung-hang Yüeh to convey the fundamental opposition of the Xiongnu to the Han:

> "All the multitudes of the Hsiung-nu (Xiongnu, Khunnu) would not amount to one province of the Han empire. The strength of the Hsiung-nu lies in the very fact that their food and clothing are different from those of the Chinese, and they are therefore not dependent on the Han for anything. Now the Shan-yü has this fondness for Chinese things and is trying to change the Hsiung-nu customs. Thus though the Han sends no more than one-fifth of its goods here, it will in the end succeed in winning over the whole of the Hsiung-nu nation. From now on when you get any Han silks, put them on and try riding your horses through brush and brambles! In no time your robes and leggings will be torn to shreds and everyone will see that silks are no match for the utility of felt and leather garments. Likewise when you get any of the Han foodstuffs, throw them away so that people can see that they are not as practical or tasty as milk and kumiss!"
>
> -Sima Qian, *Shi ji* (Watson 1961, 2: 170)

Note how it is the food and clothing of the Xiongnu that give them their might and identity. Those foodstuffs and clothes are specifically products of a (mobile) pastoral political economy: felt, leather, milk, and fermented mare's milk (*kumiss*[11]). The Xiongnu would risk their sovereignty and their geopolitical advantage if they were to replace the clothes, food, and material culture of their mobile pastoral life with their counterparts in Han China. The implication is clear: the nature of Xiongnu society and imperial project are deeply imbricated in the fundamental, seemingly-mundane details of a mobile pastoral way of life. The Xiongnu live

[11]Fermented mare's milk is a historically-attested and popular beverage of Mongolic and Turkic peoples across Inner and Central Asia known by a variety of names, including: *qumis*, *kumis*, *kumiss*, and *airag*.

as mobile pastoralists; they eat dairy products from the herd animals that they raise and milk, they ferment mare's milk (*kumiss* above), they ride their horses through brush and forest, and they wear processed wool and skin (felt and leather) harvested from their living and dead herd animals. Sima Qian thus implies that these practices and products of a mobile pastoral way of life are essential to 'Xiongnu-ness': political identity and subjectivity. Although a politician-turned-historian (Sima Qian[12]) rather than an ethnographer produced this text, the author used details of a mobile pastoral way of life to juxtapose the Xiongnu to the settled agrarian Han, forming a lynchpin in the case for irreconcilable differences between the two empires.

A second of the three foundational Chinese texts on which the historical narrative of the Xiongnu rests evinces a similar preoccupation with the centrality of a mobile pastoral way of life to an understanding of the Xiongnu, again through the figure of Chung-hang Yüeh. In his *Han shu* [Wylie, 1894; Parker, 1892-1893], Ban Gu 'speaks' through Chung-hang Yüeh on a similar subject: the Xiongnu mobile pastoral way of life. Here Chung-hang Yüeh mounts a case for the superlative relationship between the Xiongnu way of life and their political economy:

> "The Hun (Khunnu/Xiongnu) customs are to eat the flesh of their herds, drink their juices, and wear their skins: these herds feed on the grass and drink the water, moving to and fro according to season: hence, in times of need, every man is practiced in horse archery; while in peaceful times, every man is happy and at leisure: the government is direct and easy to carry out: the relation between prince and subject is to the point and durable"
>
> - Ban Gu (*Han shu*: Parker 1892-1893: 16)

[12]Sima Qian's life as a court official ended when he disagreed with the emperor over a military defeat at the hands of the Xiongnu, and was summarily castrated and imprisoned (Watson, 1963). Sima Qian had begun his *Shi ji* before this catastrophe but recommenced his work, now a palace eunuch, after his prison sentence ended (ibid). Some scholars thus read the *Shi ji* as both Sima Qian's analysis of the Xiongnu and subtextual critique of Han political society informed by his personal experiences (Goldin, 2011).

In the above passage, Ban Gu locates the Xiongnu Empire's political success in their mobile pastoral way of life. The animal husbandry and mobility required of mobile pastoralism, in Ban Gu's estimation, foster a political community that is flexible to shifting circumstances. Thanks to the mobile pastoral way of life, the Xiongnu body-politic pivoted seamlessly between 'peace' and 'war'. The Xiongnu imperium appears here constituted by political relations that are "to the point and durable". Ban Gu presents the reader with a vision of the Xiongnu Empire as a successful imperial formation shaped and enabled by its subjects' mobile pastoralism. Through Chung-hang Yüeh, both the *Shi ji* and *Han shu* convey the Xiongnu's strength through their mobile pastoral way of life. That mobile pastoral way of life creates the distinct otherness of the Xiongnu from the Han perspective; Xiongnu otherness was by no means solely characterized as positive in Han texts.

The appearance of the Xiongnu as geopolitical rivals index a shift in Chinese imperial ideology married to a change in international policy (Schaberg, 1999; Goldin, 2011). According to Sima Qian's *Shi ji* quoted in a previous section, "their inborn nature" opposes the Xiongnu to a project of civilization by conquest and assimilation into the Han dynasty. In that section of the *Shi ji*, Sima Qian makes specific policy recommendations to Han officials tasked with dealing with the Xiongnu in the hopes that they will approach their nomadic neighbors to the north as hostile, intractable foes. Sima Qian and Ban Gu anchor this otherness, the inborn nature contrary to Han political society and subjectivity, in aspects of their mobile pastoral lifeway and mode of production. "[N]omads' habits differ *because* of their inborn nature…The Xiongnu can never be regarded as equals because they are constitutionally unsuited to civilized life and must be treated as permanent enemies with whom, under the best of circumstances, one can only hope for an uneasy détente" (Goldin, 2011: 229; emphasis mine). The Xiongnu are the original outsiders in the historical imagination of sedentary Chinese statecraft. It is significant that Xiongnu 'otherness' is deeply embedded in and demonstrated by the 'alien' Xiongnu way of life: mobile pastoralism (nomadism).

Is it possible that the 'otherness' of the Xiongnu laid out by significant Chinese historians cut both ways? William Honeychurch investigates this issue by re-examining Han texts for evidence of what the Xiongnu thought of their own mobile pastoral 'nature' (2012). He points to "a famous letter to the Han Emperor Wen (ca. 176 BC)" written by Modun (Maodun) *shanyu*, where the Xiongnu ruler "declared himself uniter of all those who draw the bow into one family. In reply, Emperor Wen affirmed his domain over all southern peoples who wear hats and sashes (Di Cosmo 2002:196). Communications from the Shanyu to the Chinese usually emphasized the pastoral way of life by referencing movement and the herding of animals, especially cattle and horses (Yü 1990: 123). Though Chinese cultural rhetoric has some role in the reporting of these texts, to the extent that the letters represent the leadership of two competing states, they suggest that cultural dichotomies were important in reifying both the Xiongnu and Chinese political communities. Similar cultural ideologies have been reported in many pastoral-based polities and provide a model for their political function" (2012: 43-44)[13].

In this intriguing hypothesis, Honeychurch presents a conscious adoption of mobile pastoralism by the imperial elite (the *shanyu* himself) as an identifying, constitutive quality of political subjectivity. According to this reading of Modun *shanyu*'s letter, the founder of the Xiongnu Empire drew self-consciously from the very base of his society (i.e., mobile pastoral

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[13]Here Honeychurch is referencing the following passage from the Shi ji: "With the assistance of Heaven, the talent of officers and soldiers, and the strength of the horses the wise king of the right has succeeded in destroying the Yüeh-chih, and in unsparingly killing them or bringing them into submission. Lou-lan, the Wu-sun, the Hu-chieh and other twenty-six states contiguous to them are now part of the Hsiung-nu. All the people who draw the bow have now become one family and the northern region (*pei chou*) has been pacified" (Di Cosimo, 2002: 196; Di Cosimo's translation of *Shi ji* 110, 2896)

lifeways) to assert the legitimacy and political coherence of the imperial project to the outside. Honeychurch's interpretation further indicates that Modun *shanyu* simultaneously made an internal assertation of political solidarity rooted in a shared wellspring of practices, values, and beliefs shared across the sociopolitical hierarchy of Xiongnu imperial society. The letter records an ideological claim about a lifeway and way of being shared from the humblest commoners to the *shanyu* himself as a (if not the) fundamental quality that united the political subjects who constituted the empire. The Han identified and othered the Xiongnu through their mobile pastoral way of life; Honeychurch suggests that the Xiongnu may have made themselves as a political community by reifying their mobile pastoralism.

Introductory passages in key Chinese texts about the Xiongnu support Honeychurch's hypothesis in their framing of Xiongnu imperial society. In the *Han shu*[14], Ban Gu writes that "[f]rom the king [*shanyu*] downwards all ate the flesh of domestic animals, and clothed themselves with the skin" (Wylie, 1874: 402); a very similar description appears in the *Shi ji* by Sima Qian (Watson, 1961). All strata of Xiongnu society, from the *shanyu* "downwards", thus rely on mobile pastoralism for their sustenance, implying a shared value for mobile pastoral lifeways if not a universally-shared way of life. While Han texts likely reflected what the Han thought about the Xiongnu rather than how the Xiongnu viewed themselves, what Honeychurch has identified in this letter between two emperors suggests that scholars should consider the role of mobile pastoralism within the Xiongnu Empire beyond the realm of political economy, particularly given the undeniably significant inclusion of livestock remains in Xiongnu mortuary contexts. As mentioned above, archaeological research suggests that mobile pastoralism and its domesticated herd animals likely played important roles in Xiongnu ideology and cosmology.

[14] *Book of the Han*, Book 94; trans. Wylie, 1874)

This topic will receive fuller explication in the next chapter. Honeychurch's hypothesis links that idea and evidence in the historical record for mobile pastoralism used in Xiongnu imperial ideology. Simply entertaining a potential connection between mobile pastoralism as a way of life and political economy and ideologies and logics of imperial subjectivity and authority stands in contrast to much traditional theorization of political complexity within nomadic societies.

2.6 The Xiongnu as Nomadic Empire

Dominant theories of the rise, expansion, various fissions, and ultimate collapse of the Xiongnu Empire rested upon interpretations of the Chinese textual record until well into the 20th century, and arguably still appear today. Barfield (1981) provides a succinct overview of how mid-20th century scholars of mobile pastoralism (or nomadism) theorized the emergence of states, empires, and other complex political formations from such a 'deficient' political economic base. He critiques early scholars of state formation and political complexity among nomads (mobile pastoralists) – Radloff and Barthold, Harmatta and Krader – who conceptualized the rise of nomadic empires as the result of internal dynamics (emergence of a great charismatic leader or of class relations, respectively) and presents a counterargument that nomadic states and empires emerged in reaction to a strong neighbor (imperial China, in the case of the Xiongnu). The tribal organization and kinship systems of nomadic societies in and of themselves cannot generate the kind of political complexity and hierarchy needed to form a state or empire, and "[i]t owed its continued survival and its stability to the role it played as intermediary between China and the tribes on the steppe" (1981:47).

As Anne Porter argues in *Mobile Pastoralism and the Formation of Near Eastern Civilizations*, many think "that pastoralists were simply not capable of doing the things that settled people do, if only because they lacked the ability to organize in the same way. The reasons for that lack were thought somehow inherent in the nature of pastoralism itself, so that a situation observable in the modern world was, naturally, in place in the ancient world. Many factors contribute to this view, but the essential line of argument, deriving from anthropological research, was that animal husbandry and mobility both preclude the accumulation of differentials in wealth that leads to social stratification and that in turn leads to complexity. Mobility also constrains social interactions and organization so that to be pastoralist is essentially to be tribal and tribe is always something other than the state" (Porter, 2012: 2).

The above passage reveals more about those promulgating ideological frameworks that assume an inherent 'lack' in societies that organize themselves into nomadic or mobile pastoral lifeways than about mobile pastoralism itself. Porter identified two core assumptions of the ideological frameworks that consider mobile pastoral and nomadic societies as inherently incapable of political complexity and stratification: 1) the tribal organization of these societies, and 2) the mobile pastoral mode of production. Anthropology has a long history with the concept of 'tribe' that implicitly or explicitly counters a complex, stratified, and historical political system (cf. Evans-Pritchard, 1940a; Sahlins and Service, 1960; Gluckman, 1963). In response to this anthropological tradition and the use of 'tribe' in Inner Asian political history, David Sneath marshals a thorough refutation of the assumption that kinship necessitates tribal societal organization and forecloses dynamic political institutions (2007).

An expansive body of literature examines the interpretive challenges posed by the phenomena of states and empires among mobile pastoral societies (see Barfield, 1989, 2001a;

Khazanov, 1994; Humphrey and Sneath, 1999; Kradin, 2002; Honeychurch and Amartuvshin, 2006; Rogers, 2007, 2012; Sneath, 2007; Frachetti, 2008, 2012; Kradin and Skrynnikova, 2009; Di Cosmo, 2013; Honeychurch, 2014, 2015). Mobility has proven a powerful analytic by which to interrogate the dynamics of sociopolitical entities, particularly in the case of Inner Asian states and empires with the Xiongnu serving as a dominant representative (Rogers, 2007; Sneath, 2007; Honeychurch, 2015).

Empirical research on the ethnography, history, and archaeology of mobile pastoral contexts in Inner Asia challenges these visions of mobile pastoral polities, marshaling arguments for dynamic and complex political formations imbricated in flexible, multi-resource subsistence and exchange systems (Chang and Koster, 1994; Humphrey and Sneath, 1999; Frachetti, 2012; Honeychurch, 2014). A number of archaeologists working with eastern Eurasian and Inner Asia datasets contend that mobile pastoral peoples curate and deploy expertise across domains of multiscalar spatial political practices, cross-cultural regimes of value creation, and flexible approaches to sovereignty as a negotiated process in the creation and maintenance of their polities, states, and empires (Honeychurch and Amartuvshin, 2006; Frachetti, 2008, 2012; Rogers, 2007, 2012, 2015; Wright, 2012; Yao, 2012; Honeychurch, 2015; Miller and Brosseder, 2017).

Political dynamics and institutions deriving from a mobile pastoral way of life could represent an 'alternative pathway to complexity' (Honeychurch, 2014) in comparison to classic anthropological schemes of statehood and political complexity emerging from sedentary agricultural contexts. The Xiongnu serve as a critical example in these reconsiderations of the 'innate limitations' on political complexity assumed inherent to mobile pastoral societies (Honeychurch, 2015). It is no coincidence that such critiques and alternative perspectives on nomadic and mobile pastoral political dynamics are drawn from empirical evidence generated within the realm of archaeological knowledge production.

The Xiongnu Empire serves as a watershed moment within the narrative of Inner Asian history as characterized by the rapid rise and ephemeral domination of nomadic empires over their settled agrarian neighbors (Di Cosmo, 1994, 1999; Kessler, 1993; Honeychurch and Amartuvshin, 2006, 2007; Barfield, 2001b, 2011). Other expansive polities of mobile pastoral peoples shaped the Late Bronze and Iron ages of the Eurasian steppe and numerous contact zones between "the steppe and the sown" (Peterson et al., 2006) prior to the appearance of the Xiongnu Empire: the Scythians, Saka, Wusun, Cimmerians, Sarmatians, and others (Minns, 1913; Jettmar, 1970; Herodotus, n.d.; Melyukova and Crookenden, 1990; Davis-Kimball et al., 1995, 2000; Jacobson, 1995; Jacobson-Tepfer, 1999; Aruz et al., 2006; Legrand, 2006; Honeychurch, 2015; Chang, 2018).

Although current archaeological data leave the exact nature of the relationships between preceding political communities and the Xiongnu Empire unresolved, the Xiongnu emerged as the first imperial project undertaken by mobile pastoral communities in eastern Eurasia and Inner Asia (Brosseder, 2019). The Xiongnu imperial formation rested on heightened economic prowess due to their roles as mediators of cross-cultural, long-distance commodity exchange (Di Cosmo, 1994, 1999), relatively long periods of political stability (Barfield, 2001b), and invention or at least solidification of techniques of sovereignty and authority that subsequent nomadic empires consciously adopted (Allsen, 1996; Atwood, 2004). As Di Cosmo writes, "the Xiongnu, no matter what definition we use to refer to their polity, formed an empire. Like other empires, they projected their power and extended their territory far beyond their original homeland (whose actual location remains undetermined archaeologically), possessed a variety of ethnic and linguistic components, and had relations with China and other states in which the imperial status of its supreme head, the *chanyu*[15], was implicitly or explicitly recognized as having the same dignity as that of the Chinese emperor" (2013: 25). Di Cosmo bases his strong argument for the imperial nature of the Xiongnu polity and thus their significant status within the political history of Inner Asia and eastern Eurasia on increases in scale and complexity of political life from prior steppe or nomadic polities and political communities coupled with a transformation in their relations with other imperial powers (notably China). Thus, for Di Cosmo (and other scholars like William Honeychurch and David Sneath), the Xiongnu as an imperial formation represents a leveling-up of mobile pastoral political life in eastern Eurasia.

Archaeological knowledge production plays a crucial role in elucidating the political capacities and dynamics of the Xiongnu Empire in particular and of mobile pastoral societies more generally. Political complexity within past mobile pastoral contexts may manifest as hierarchical political structure and sophisticated strategies of authority. Recent archaeological research posits that political complexity in mobile pastoral societies may derive from or relate to core characteristics of mobile pastoral lifeways: a livestock-centered political economy facilitated through increased mobility (Honeychurch and Amartuvshin, 2006; Frachetti, 2008, 2012; Rogers, 2012, 2017; Honeychurch, 2015; Miller and Brosseder, 2017). Key arguments in this line of knowledge production derive from analyses focused on or incorporating archaeological datasets from Xiongnu contexts.

The articulation of the Xiongnu Empire as an object of analysis informed by the archaeological record has played a formative role in testing hypotheses about the political potentialities and pathways available to nomadic or mobile pastoral peoples. However, the

[15]Alternative transcription of *shanyu*.

Xiongnu as constituted through Han written accounts and subsequent centuries of text-focused scholarship set the framework for archaeological understanding of this first steppe or nomadic empire. That legacy continues to shape the archaeological imagination even as a rich material record analyzed over decades of Xiongnu archaeology continues to challenge many aspects of that foundational framework. One common theme that persists from the historical record to the archaeological is the evidence for mobile pastoral lifeways within the Xiongnu Empire.

The following chapter lays out how pastoralism or mobile pastoralism was present in the earliest archaeological imaginings of the Xiongnu, perpetuating core ideas about the Xiongnu first present in Han historical documents that remain central to scholarly understanding of this first nomadic empire. As Xiongnu archaeology developed as a field of study, evidence to counter or support the text-based articulation of the Xiongnu fueled novel interpretations of Xiongnu political dynamics, historical transformations, societal structure, imperial ideologies, lifeways within the empire, and foreign relations. A tremendous strength of archaeological approaches to the Xiongnu is their focus on the material record produced by the Xiongnu themselves. Archaeology thus opens windows into the Xiongnu Empire and its subjects elided by or unknown to those who produced texts about them.

CHAPTER 3

ARCHAEOLOGY OF THE XIONGNU/KHÜNNÜ

3.1 Introduction

Historical understanding of the Xiongnu pre-dates any archaeological articulations of the Xiongnu by over a millennium. Historians constructed the Xiongnu as an object of analysis within their mode of knowledge production using textual sources written about the Xiongnu by others. This articulation of the Xiongnu represents a complicated inheritance bestowed on Xiongnu archaeology. While the *Shi ji*, *Han shu*, and *Hou han shu* provide invaluable information about the empire, they present views of the Xiongnu that are figuratively and literally partial. Some aspects of Xiongnu archaeology have served as proverbial handmaidens to historical analyses and understandings of the Xiongnu, although scholars of the Xiongnu are increasingly reflexive and transparent about their negotiations between textual and material records (Miller, 2009; Brosseder and Miller, 2011; Di Cosmo, 2013; Honeychurch, 2015).

The Xiongnu as written about by their neighbors-cum-rivals are cast as Other, barbarian, and a threat; on the other hand, the ideological orientation of these core texts seems to have prompted their authors to highlight the importance of mobile pastoralism within the imperial body-politic. That text-based interpretation of the Xiongnu as (mobile) pastoralists found support in the archaeological record from the earliest expeditions of the late 19th century (Rudenko, 1962; Törbat, 2004; Honeychurch, 2015). Archaeological inquiry articulates and examines the Xiongnu as an object of analysis using empirical evidence, methods, and theoretical frameworks not shared by historical analysis; thus, archaeological and historical understandings of the Xiongnu should diverge (Di Cosmo, 2013; Miller, 2014; Honeychurch, 2015; Chernykh, 2017).

Subsequent sections will focus on archaeological understandings of the Xiongnu, noting the disjunctures between the above-outlined historical narrative of the empire and the archaeological record from burials, ritual contexts, settlements, production sites, and ephemeral habitation contexts. The assumption of Xiongnu mobile pastoralism pervades the archaeological perspectives on the first imperial nomads, much as it does in the historical imagination. The material record left behind by the Xiongnu has yielded empirical evidence suggesting the centrality of the five muzzled beasts (and other nonhuman animals) and their relationships to people across the economic, social, and political spheres of Xiongnu society.

This chapter briefly recounts the history of Xiongnu archaeology around the theme of mobile pastoralism and the presence of nonhuman animals in Xiongnu contexts and material culture. Not only did the text-based understandings of the Xiongnu Empire as fundamentally mobile pastoral greatly shape interpretations of the Xiongnu, this articulation of the Xiongnu found empirical support in the livestock remains consistently recovered during excavations of tombs across Mongolia and southern Siberia. But the presence of nonhuman animals in the archaeology of the Xiongnu expanded beyond unmodified livestock and other nonhuman animal bones, teeth, antler, and horncore. Nonhuman animals populate Xiongnu material culture as representations, as objects fashioned from their bodies, and as combinations of the two. Although the excavation of mortuary contexts and the analysis of their contents has dominated Xiongnu archaeology, the discipline has expanded its métier to investigate the contexts of the living: habitation sites, production centers, settlements, and broader archaeological landscapes. Such work has generated novel datasets that complicate the perception that mobile pastoralism was a single lifeway practiced universally within the Xiongnu Empire. Yet I argue that archaeological evidence confirms the prevalence of mobile pastoral practices in Xiongnu contexts of the living and the dead, and that the most direct evidence for the centrality of mobile pastoralism to the Xiongnu still comes to us from their tombs.

3.2 A Brief History of Xiongnu Archaeology

The first view of the Xiongnu from the material evidence of their own works, lives, and deaths came via the emergence of Xiongnu archaeology. The archaeology of the Xiongnu Empire spans the late 19th century to the present third decade of the 21st century. Xiongnu archaeology in Mongolia encompasses what we might call a 'long century' that the archaeologists G. Regzen and N. Batbold (2007) have divided into five phases: 1924 to 1950; 1955 to 1960; 1961 to 1985; 1986 to 1994; and 1994 to 2007. Regzen and Batbold's (2007) chronology describes eighty years of archaeological research in what are now the Russian Federation, Mongolia, and the People's Republic of China. Predating Regzen and Batbold's earliest phase of Xiongnu archaeology is a period of proto-archaeological exploration and planned looting at major Xiongnu sites in imperial Russia and recent-liberated Mongolia from 1896 to 1912.

Archaeological research into Xiongnu contexts and materials in Mongolia has continued in the years postdating Regzen and Batbold's chronology. Since that time, Xiongnu archaeology has been defined by an increase in long-term international collaborative archaeological projects on Xiongnu contexts and materials in Mongolia, the proliferation of methodologies deployed on Xiongnu archaeological materials (including stable isotope analysis, calibrated radiocarbon dating, ancient DNA and proteomic analyses, and more), and state-sponsored cultural resource management (CRM) projects throughout Mongolia that often record and excavate Xiongnu contexts.

Decades of Xiongnu archaeology have yielded empirical evidence from mortuary, habitation, and activity contexts that complicates the historical narrative about the Xiongnu conveyed in Han texts. Moreover, archaeological research into the Xiongnu Empire has prompted new theories about political complexity and imperial formations among mobile pastoralists (nomads) and their descendants. Much of the archaeological evidence comprises nonhuman animal bodies: their materials remaining long after death in Xiongnu settlements, seasonal encampments, and ritual contexts; their associations with human bodies in mortuary space; their transformations into tools, weapons, and artwork; and their representations in various media (including wood, metal, and textile). Animal materials (Conneller, 2011) and representations of nonhuman animal bodies indicate the centrality of nonhuman animals and their relationships with humans to the Xiongnu Empire in life and after death.

3.3 Archaeology of Xiongnu Politics and Economies

3.3.1 Five muzzled beasts and mobile pastoralism in the development of Xiongnu archaeology

Nonhuman animals, particularly the five muzzled beasts, are consistently found in association with humans in the two primary types of Xiongnu mortuary context and across a variety of habitation contexts in Mongolia, southern Siberia, and Inner Mongolia. The intentional interment of domesticated herd animal remains in Xiongnu mortuary contexts, thus deliberately assembled with Xiongnu human remains in ritual spaces, is a crucial archaeological finding that motivates this project's inquiry into the role of human-animal relationships (specifically those of domesticated herd animals and people) in potent logics, values, and beliefs played out in mortuary practice. Human-animal relationships that form the core of mobile pastoral lifeways (see Chapter 5), such as those presumably practiced by the Xiongnu or at least core segments of the imperial body-politic, embody internal ideological and political dynamics of a mobile pastoral society. Such a perspective shifts analytical focus onto dynamics internal to Xiongnu society that may derive from mobile pastoralism as a way of life and political economy. What follows is a discussion of the empirical evidence that mobile pastoralism constituted a core component of the Xiongnu Empire primarily through relationships between humans and domesticated herd animals in life and death.

From its earliest decades, the archaeology of the Xiongnu presumed a pastoral, or livestock-based mode of production underlying the society and its political structure (see Törbat, 2004; Regzen and Batbold, 2007). The Buryat archaeologist and leader of the first joint Buryat-Mongolian archaeological expedition (1928-1929) Georgy Petrovich Sosnovskii (sometimes Sosnovsky) posited that the Xiongnu were a semi-mobile people engaged in animal husbandry for their primary mode of subsistence (Törbat, 2004; Regzen and Batbold, 2007). Sosnovskii's characterization of the Xiongnu political economy and way of life as pastoral would set the stage for future archaeological interpretation. Sosnovskii synthesized results from excavations of Xiongnu contexts in Transbaikalia: his own archaeological research at the cemetery at Burgast Am and the settlement at Ivolga gorodishche, and analyses of Tal'ko-Gryntsevich's earlier work at Xiongnu sites such as Derestuy. Most significantly, Sosnovskii incorporated the stunning and recent finds from monumental burials at Noyon Uul excavated in 1924-1925, 1926, and 1927 by a series of Soviet explorer-adventurers, archaeologists, and geographers: P.K. Kozlov, S.A. Teploukhov, G.I. Borovka, and A. Simukov (Törbat, 2004; Miniaev and Elikhina, 2009).

Prominent Mongolian archaeologists of the mid- and late 20th century developed the connections between the Xiongnu Empire and (mobile) pastoralism posited by their predecessors. Two of Mongolia's most illustrious 20th-century scholars, Ts. Dorjsüren and Kh. Perlee, specifically located the origin of Mongolia's imperial nomadic traditions in the Xiongnu archaeological culture (Dorjsüren, 1961; Perlee, 1961). One could further argue that study of the Xiongnu and its (mobile) pastoral character was a formative element in the emergence of secular academic institutions in modern Mongolia; each scholar published a foundational Mongolian-language monograph in 1961, the same year that the Mongolian Academy of Sciences[16] was formally established. Dorjsüren focused his scholarly attention on the Xiongnu in his seminal work, *The Northern Khünnü*[17]. Typologies of mortuary contexts that Dorjsüren proposed in *The Northern Khünnü* have endured over decades of archaeological research into Xiongnu contexts[18], demonstrating the centrality of Dorjsüren's work to Xiongnu archaeology.

In *The Northern Khünnü*, Dorjsüren noted the regular presence of nonhuman animals – notably the livestock of modern Mongolian mobile pastoralism – in Xiongnu mortuary contexts and heavily implied that mobile pastoralism (or nomadism) significantly shaped the Xiongnu

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[16] Монгол Улсын Шинжлэх ухааны Академи (*Mongol Ulsyn Shinjlekh ukhaany Akademi*)

[17] *Umard Khünnü* (*Ertnii sudlalyn shinjilgee*) / *Умард Хүннү* (*Эртний судлалын шинжилгээ*). *Эртний судлал / Ertnii sudlal* is a somewhat outdated Mongolian term for "archaeology", literally translating to "ancient studies". The term *археологи* / *arkheolog'*, borrowed from the Russian *археология* / *arkheologia*, is today the more commonly used term in the Mongolian lexicon.

[18] "Дээрхи зохиол хэвлэгдэн гарснаас хойш олон жил өнгөрч, энэ хооронд шинээр илэрсэн Хүннүгийн дурсгалт газар хэд дахин нэмэгдсэн ба малтсан булшны тоо хэдэн аравт хүрсэн ч Ц.Доржсүрэнгийн хийсэн булшны гадаад болон дотоод хэлбэрийн ангилалд төдий л өөрчлөлт оролгүй өнөөг хүрчээ" ["Many years have passed since the publication of (*Northern Khünnü*), during which time the number of newly-discovered Xiongnu monuments has multiplied, and the number of excavated graves has increased tenfold. Yet Dorjsüren's typologies of internal and external tomb structure has changed very little"] (Regzen and Batbold, 2007: 12-13).

Empire (Dorjsüren, 1961). Dorjsüren lists numerous types of domesticated and wild animals recovered from archaeological excavations in Mongolia, including the elite necropolises of monumental burials in the Xiongnu imperial heartland of northern Central Mongolia and across the Mongolian-Russian border in southern Siberia. He specifically mentions Bactrian camels[19], mules[20], and donkeys[21], and their importance in Xiongnu mobile pastoralism, although the zooarchaeological challenges to reliably distinguishing between extant equids casts some doubt on the empirical basis of these claims (see Hite, n.d.a).

Dorjsüren's research is an early entry in a developing corpus of evidence for the diversity of nonhuman animals, particularly representatives of the domesticated herd animals of present-day Mongolian mobile pastoral lifeways, in the Xiongnu world and their centrality to ritual practice. Perlee's scholarship took a more diachronic approach compared to Dorjsüren's focus on the Xiongnu as an archaeological culture. Nevertheless, the Xiongnu formed an important component of Perlee's theorizations about the origins and development of imperial nomadic formations in Mongolian history.

While much of mid- and later 20th century archaeological research on the Xiongnu Empire explored the ethnogenesis and ethnic affiliation of the Xiongnu (particularly in reference to historical and modern Mongols), a parallel connection was regularly asserted between the Xiongnu and other peoples of Mongolia (notably historical and modern Mongols) through the mobile pastoral or nomadic way of life (Perlee, 1961; Batsaikhan, 2003; Törbat, 2004). During this time period, the consistent presence of domesticated herd animal remains in mortuary contexts and the relative dearth of settlements and habitation sites continued to inform the

[19] *Temee* (тэмээ)
[20] *Luus* (луус)
[21] *Iljig* (илжиг)

fundamental hypotheses about the Xiongnu as an empire of mobile pastoralists. With the collapse of the Mongolian People's Republic[22] in 1992, an influx of international archaeological expeditions expanded existing research through the application of new methodological and theoretical approaches (Rezgen and Batbold, 2007).

Over the past 25 years, archaeological field research projects have expanded upon previous research to reveal the distribution of Xiongnu material culture, mortuary sites, and settlements throughout Mongolia, northern China (mostly Inner Mongolia), and southern Siberia (Erdenebaatar et al., 1999; Erdenebaatar, 2000; Kradin, 2005; Regzen and Batbold, 2007; Miller, 2009; Minyaev, 2009; Honeychurch, 2015). These data evince a geographically-expansive imperial project that incorporated diverse and far-flung communities, displayed complex internal organization, and engaged in relations of exchange across ancient Eurasia (Törbat, 2004; Miller, 2014; Honeychurch, 2015; Miller and Brosseder, 2017). Methodologies used to expand archaeological understanding of the Xiongnu have dovetailed with innovative theoretical inquiry in recent years. The pastoral or mobile pastoral nature of the Xiongnu Empire threads through Xiongnu archaeology and implicitly or explicitly informs current archaeological investigation.

3.3.2 Framing the Xiongnu Empire in archaeological knowledge production

In the archaeological record of what is now Mongolia, the Xiongnu Empire postdates a complex aggregate of monumental landscapes and material culture distribution that characterize the Late Bronze (1400-1000 BCE), Final Bronze (1000-750 BCE), and Early Iron ages (750-300 BCE: Honeychurch, 2015). Researchers are still working to elucidate linkages between the

[22] Бүгд Найрамдах Монгол Ардын Улс (*Bügd Nairamdakh Mongol Ardyn Uls*)

diverse, complex landscapes of monumental construction and mortuary spaces of the Mongolian Bronze and Early Iron ages and the Xiongnu imperium. However, available evidence from early Xiongnu burials with established radiocarbon dates at two distinct, intensively-researched archaeological landscapes in Central Mongolia (Egiin Gol to the wooded mountainous north and Baga Gazryn Chuluu to the red-rock south of the northern Gobi desert) indicates some continuity between the people who produced the early Xiongnu burials and their immediate chronological predecessors (i.e., Slab burials: see Honeychurch, 2015).

Many scholars locate the birthplace and center of the Xiongnu Empire in northern Mongolia and southern Siberia (Transbaikalia, Tuva near the Mongolian border) based on the distribution and dating of mortuary complexes, habitation sites, walled sites, and ritual complexes (Bemmann, 2011; Honeychurch, 2015; Wright, 2021). Another contingent uses a combination of textual interpretation and Final Bronze and Early Iron age mortuary complexes (particularly Maoqingguo, Xigoupan, Taohongbala, Hulusitai, and Aluchaideng) to argue that Inner Mongolia was the cradle of the Xiongnu Empire (see Di Cosimo, 2002). However, Honeychurch critiques the idea of an Inner Mongolian origin of the Xiongnu, pointing out that it is based on "fairly weak evidence, such as artifact styles not associated with the early states of China or the presence of domestic herd animals…The material culture and organizational patterns [of these sites] are different from those associated with the Xiongnu in Mongolia and are also different from place to place within the Ordos zone [within Inner Mongolia]. There is little evidence for the kind of regional complexity seen in Mongolia…and furthermore, the few cemeteries having material patterns related to those in Mongolia are later in date (c. late second/first century BC to AD second century)" (2015: 227).

This project follows the lead of Honeychurch (2015) and other archaeologists who locate the initial regional core of the emerging Xiongnu Empire along a roughly north-south axis running through Central Mongolia from the northern Gobi desert region (the Baga Gazryn Chuluu archaeological landscape) to the northern *khangai*[23] region near what is now the border with Russia (the Egiin Gol archaeological landscape). The imperial polity would expand across the entirety of Mongolia and into Tuva, Buryatia, northern China (Inner Mongolia, Xinjiang/East Turkestan), and Kazakhstan. The project focuses primarily on archaeological assemblages and sites from this imperial heartland and tables consideration of those from other regions where Xiongnu material culture and contexts have been identified[24]. The original analyses at the heart of this project were conducted on human and nonhuman animal remains (bioarchaeological and zooarchaeological assemblages, respectively) from eight ring tombs from a smaller Xiongnu cemetery (Elst Ar) in or very near the Xiongnu initial regional core and subsequent imperial heartland (see Chapter 4). As a result, this project is more specifically an inquiry into human-animal relationships constructed through mortuary practice by Xiongnu who lived within the imperial heartland rather than a geographical periphery of the empire. Moreover, the Xiongnu who buried their dead at Elst Ar did not belong to what archaeologists generally consider the upper echelons of Xiongnu imperial society, constructing tombs widely interpreted as those of local or community elites (see Chapter 4).

[23] *Khangai* refers to the wooded, mountainous ecozone running through the northern and central portions of Mongolia, where many major rivers are located (see Bawden, 1997).
[24] The extensive Xiongnu archaeological literature in Chinese on sites in Inner Mongolia, Xinjiang, and other regions of northern China is beyond the scope of this project and the reading abilities of this researcher.

3.4 Archaeology of Xiongnu Lifeways

3.4.1 Residential patterns and variation

Xiongnu tombs constitute the core of Xiongnu archaeology as a source of empirical data; they are the site type most emblematic of the Xiongnu archaeological culture. Xiongnu tombs have been objects of intense interest – from scholarly investigation to avaricious looting – for over a century. Although Xiongnu residential sites comprise an important source of empirical evidence on life within the empire, Xiongnu mortuary contexts and the materials they contain provide the bulk of data with which archaeologists work. One might argue that archaeologists know the Xiongnu primarily from their tombs.

Burials, walled settlement and other habitation sites, and ritual contexts identified as Xiongnu exist across the entirety of Mongolia, parts of southern Siberia, and some areas in Inner Mongolia; material culture and some mortuary practices associated with Xiongnu archaeological types appear in Manchuria, Kazakhstan, Minusinsk, and Xinjiang/East Turkestan (see Honeychurch, 2015: 226-227). Archaeological investigation of the Xiongnu since the 19th century has primarily focused on excavation of mortuary contexts and analyses of those contexts (comparing and contrasting methods of construction and layout across Xiongnu tombs) and their contents: assemblages of human and nonhuman animal remains; ceramics; textiles; lacquerware; objects carved from wood, antler, horn, and bone; and numerous forms of metal artifacts that include but are not limited to blades, projectiles, mirrors, and other decorative objects.

Nonhuman animal remains appear in Xiongnu contexts across the imperial sphere of influence: Mongolia, northern China, and southern Siberia. For much of the ‘long century’ of

Xiongnu archaeology, researchers inferred that the Xiongnu practiced a mobile pastoral way of life and political economy from the consistent presence of horse, cattle, sheep, and goat bones in mortuary and ritual contexts, the dearth of permanent settlements or architecture within the Xiongnu sphere of influence, and mentions of mobile pastoral practices in Chinese historical records. The details of Xiongnu mobile pastoralism often appear underdetermined, although this is changing thanks to a suite of new methodologies introduced and employed over the last 15 years. Moreover, in recent decades archaeologists have engaged in a concerted effort to expand their study of the Xiongnu beyond mortuary contexts into explorations of settlements sites (Erdenebat, 1997; Danilov, 2009; Ramseyer et al., 2009; Erdenebold et al., 2017; Yerool-Erdene and Bemmann, 2018; Miller et al., 2019; Iderkhangai, 2021), ephemeral habitation contexts (Wright et al., 2009; Houle and Broderick, 2011), metallurgical production contexts (Park et al., 2010; Amartuvshin et al., 2012; Ishtseren and Sasada, 2014; Sasada and Chunag, 2014; Miniaev, 2016), and integrated Xiongnu landscapes (Honeychurch and Amartuvshin, 2007; Honeychurch et al., 2007). These recent developments in Xiongnu archaeology grow out of much older roots.

3.4.2 Mobile pastoralism plus? Complexity in Xiongnu lifeways

While many questions about the specifics of Xiongnu mobile pastoralism as a political economy and mode of production remain, questions about Xiongnu subsistence and production strategies figured early in the 'long century' of Xiongnu archaeology. Based on G.P. Sosnovskii's 1928-1929 excavations at Ivolga gorodishche, a Xiongnu fortified settlement in Transbaikalia, archaeologists argued that the imperial political economy included, if not centered upon, a mixed agro-pastoral semi-mobile (semi-nomadic) mode of production (see Davydova, 1968, 1985; Törbat, 2004). While Tal'ko-Gryntsevich was the first to excavate at Ivolga gorodishche, Sosnovskii may be viewed as the first archaeologist to work at the site (Törbat, 2004; but see Dorjsüren, 1961). Although the centrality of mobile pastoral production to the Xiongnu Empire is largely uncontested, evidence from settlements and habitation contexts in Mongolia and Transbaikalia indicates that a range of lifeways with varied social, economic, and ideological spheres of daily life existed within the empire (Dorjsüren, 1961; Perlee, 1961; Davydova, 1968, 1985; Erdélyi, 1994; Danilov, 2009; Wright et al., 2009; Houle and Broderick, 2011; Miller et al., 2019).

After nearly a century of archaeological research into Xiongnu contexts in Mongolia, new methodologies promise to reveal aspects of diet, mobility patterns of humans and their herds, agricultural production and plant technologies currently little understood (Honeychurch, 2015; Makarewicz, 2015; Machicek et al., 2019; Wright, 2021). Xiongnu subsistence practices and economic production included but was not limited to: fishing, hunting, agriculture, foraging, household-level and specialized metallurgy, bone and lithic technologies, and ceramic production (Dorjsüren, 1961; Davydova, 1968, 1985; Regzen and Batbold, 2007; Honeychurch, 2015). Some Xiongnu settlements bear witness to indigenous craft production of ceramics (Boroo Gol: Ramseyer et al., 2009) and a variety of 'prestige' goods (Ivolga: Davydova, 1968). These economic practices are thought to indicate that Han subjects captured and assimilated into the Xiongnu Empire labored alongside local traditions of nomadic craftsmanship to produce objects constituting an elite regime of value.

3.4.3 Mobile pastoral places: Xiongnu seasonal encampments in the Khanui Valley, Central Mongolia

Although excavations at permanent settlements like Ivolga gorodishche (southern Siberia: Davydova, 1968, 1985) and Boroo Gol (Central Mongolia: Ramseyer et al., 2009) have uncovered considerable information about the diversity that comprised Xiongnu lifeways, intensive regional survey projects have identified ephemeral Xiongnu habitation and activity contexts that shed much-needed light on the mobile pastoral practices at the foundation of the empire. Most of this survey research has been conducted in Central Mongolia in the Khanui[25] Valley (Houle, 2010; Houle and Broderick, 2011) and Egiin Gol basin (Honeychurch, Amartuvshin, and Wright). The most intensively-studied of these Xiongnu ephemeral habitation contexts are those in the Khanui Valley of Arkhangai *aimag*(Houle, 2010; Houle and Broderick, 2011).

As these ephemeral habitation contexts lack the above-surface earthwork architecture of settlement sites and generally comprise scatters of ceramic sherds, small-scale metallurgy, and animal bone fragments, their survey and excavation are challenging. Fragmentary remains from domesticated herd animals – sheep, goat, horse, and cattle – comprised the bulk of zooarchaeological assemblages from the ephemeral habitation context in the Khanui Valley, supporting the hypothesis that Xiongnu political economy rested upon the five muzzled beasts mobile pastoral production (Houle and Broderick, 2011). Although zooarchaeological data indicate that sheep and goat were the predominant herd animal in the Khanui Valley, the excavated scatters of nonhuman animal bone, ceramics, and other small finds representing

[25] Often transcribed 'Khanuy'; from Ханұй.

ephemeral habitation contexts do not generate precise contours of Xiongnu pastoral production strategies, such as focus on milk, meat, and/or wool. In the Khanui Valley and Central Mongolia more broadly, the location of these scatters roughly parallels the ecological placement of modern Mongolian nomadic seasonal encampments in the area (Khanui: Houle, 2010; Houle and Broderick, 2011; Egiin Gol: Wright et al., 2009; Baruun Mukhdagiin Am: pers. obs.).

These ephemeral habitation contexts are crucial empirical evidence for mobile pastoralism among the Xiongnu. Such contexts are understood as analogous to the seasonal encampments (*ail*) of modern Mongolian nomads, in which roughly one-third of the current national population lives for most or all of the calendar year. Individual mobile dwellings (*ger*) cluster together with permanent or semi-permanent wooden pens, lean-tos, and/or shelters (*malyn khot*) for domesticated herd animals to form an *ail*. The *ail* is more than a location or collection of structures; it is an incorporation of its living inhabitants, human and otherwise, in a place to which they return daily and seasonally. In Central Mongolia today, as in much of Mongolia, herders move between four seasonal encampments: spring (*khavarjaa*); summer (*zuslan*); autumn (*namarjaa*); and winter (*övöljöö*). These ethnographic data inform archaeological interpretation of sites and material culture from the Xiongnu period and, in research programs closely studying ancient ephemeral habitation contexts, generally conform to survey data (Wright et al., 2009; Houle and Broderick, 2011).

In the Khanui Valley, a nearly-identical pattern of short-distance seasonal movement between winter and summer encampments appears to define mundane landscape use across the Late Bronze Age, Xiongnu period, and present day (Houle, 2010; Houle and Broderick, 2011). Houle and Broderick (2011) note that, while the spatial pattern of ephemeral habitation context appears constant through the Late Bronze Age and Xiongnu periods, intensity of site occupation changes with increased Xiongnu usage of 'summer' or riverine ephemeral habitation contexts. Thus, local mobile pastoral communities of the Khanui Valley may have maintained seasonal patterns of movement between ephemeral habitation contexts over generations and centuries, potentially millennia. Houle and Broderick's archaeological findings provide an empirical basis for using the mobile pastoral practices of present-day multispecies herding households in Mongolia to inform our interpretations of Xiongnu mobile pastoral lifeways. Chapter 3 will explore mobile pastoralism as documented in ethnographic literature from Mongolia and southern Siberia, details of which enliven the archaeological imagination about the seasonal patterns of Xiongnu habitation and mobility identified in the Khanui Valley and together anchor the project's analyses of Xiongnu mobile pastoralism.

3.5 Animal Materials Transformed: Representations and Manipulations of Nonhuman Animal Bodies in Xiongnu Material Culture

Xiongnu material culture teems with nonhuman animals in myriad forms, a phenomenon noted over 50 years ago (Dorjsüren, 1961: 98). Objects comprised partially or entirely of nonhuman animal material remains appear in both mortuary and habitation contexts in Mongolia and Siberia (Dorjsüren, 1961; Davydova, 1968, 1985; Konovalov, 2008; Ramseyer et al., 2009; Ankhbayar, 2017). Objects fashioned from nonhuman animal bodies – primarily durable components like bone and antler – populate Xiongnu mortuary assemblages in great variety. In Xiongnu tombs, archaeologists have identified: deer antler bridle pieces (Fig. 31; Törbat and Crubézy, 2022); bone and/or antler supports for bows and arrows (Törbat et al., 2015; BGC;); perforated sheep and/or goat astragali, sometimes also incised with abstract geometric imagery

(Fig. 3.3; Erdenebold et al., n.d.c); bone needles, hairpins (Fig. 3.4), and bone arrowheads (Figs. 3.5 and 3.6); and other worked nonhuman animal bone objects and fragments (e.g., Figs. 3.7 and 3.8).

Figure 3.1 Bridle decorations of antler and iron from Grave 97, Tamiryn Ulaan Khoshuu (image courtesy of Batsaikhan, 2006).

Figure 3.2 Bone parts of composite bow from Tomb 5, Khirgist kholooi (image courtesy of Turbat, 2013).

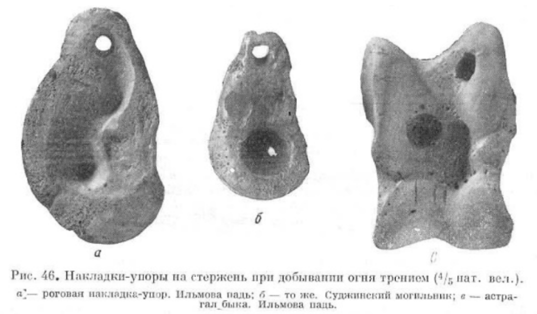

Figure 3.3 Perforated livestock astragali from Il'movaya pad'[26] and Sudzha (image courtesy of Rudenko, 1962).

Figure 3.4 Bone hairpins from Shombuuzin belchir (image courtesy of Turbat, 2013).

Figure 3.5 Bone arrowhead from Delgerkhaan Uul (image courtesy of Turbat, 2013).

Figure 3.6 Bone arrowheads from Burkhan Tolgoi (image courtesy of Turbat, 2013).

[26]Sometimes "Il'movaia pad' ".

Figure 3.7 Bone belt pendant with carved pattern from Tomb 143, Baruun Mukhdagiin Am (image courtesy of Turbat, 2013).

Figure 3.8 Bone belt buckle pieces with carved pattern from Tomb 143, Baruun Mukhdagiin Am (image courtesy of Turbat, 2013).

A remarkable example of animal bodies upon animal bodies within Xiongnu mortuary space comes from a tomb at Avyn Khökh Uul: a bow and arrow support of antler incised with a line depiction of a saddled horse in profile (Törbat et al., 2015). Each one owes its existence to the life and death of a nonhuman animal, often a member of a Xiongnu herd, as part of its transformation into "animal materials" (see Conneller, 2011).

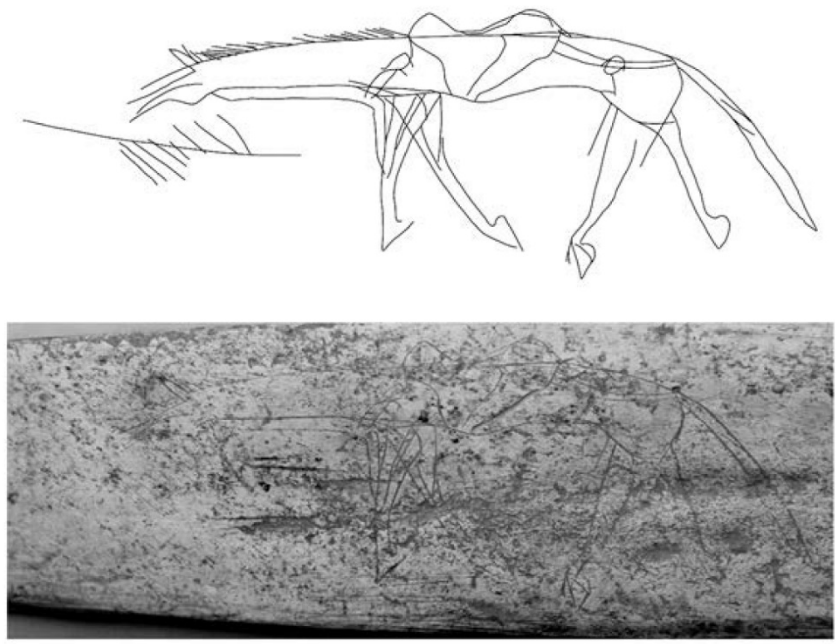

Figure 3.9 Image of saddled horse in profile incised on animal bone from Avyn Khökh Uul: line drawing and photo of original artifact (image courtesy of Törbat et al., 2015).

Mortuary assemblages recovered during Kozlov, Dorjsüren, and Rudenko's respective excavations at Noyon Uul (Noin-Ula) in Central Mongolia alone demonstrate that imagery, imaginaries, and actual bodies of nonhuman animals suffused Xiongnu aesthetics (Silk Road Seattle, n.d.; Trever, 1932; Rudenko, 1962; Erdene, 2008). Representations of imagined (mythical or chimeric) and actual nonhuman animals adorn woven and embroidered woolen and silk carpets, wall hangings, and other textiles. One of Noyon Uul's most famous objects is an applique felt and wool carpet decorated with alternating images of a griffin attacking a moose and a pair of fantastical beasts locked in combat (see Figures 3.10 and 3.11; Trever, 1932; Salmony, 1936; Rudenko, 1962).

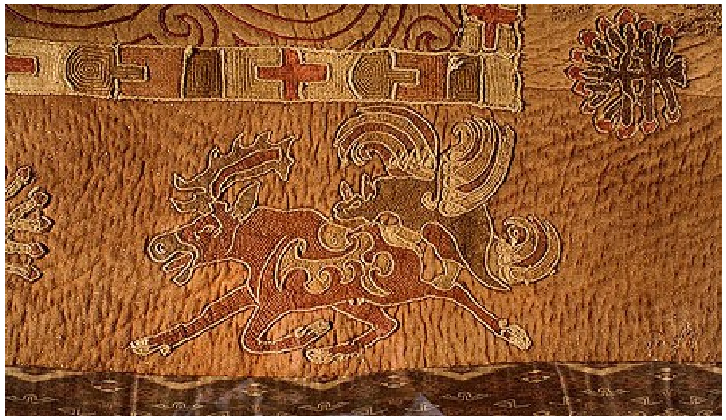

Figure 3.10 Scene of griffin attacking a moose on a carpet from Kurgan 6 at Noyon Uul (image courtesy of Borbála Obrusánszky, Wikipedia Creative Commons).

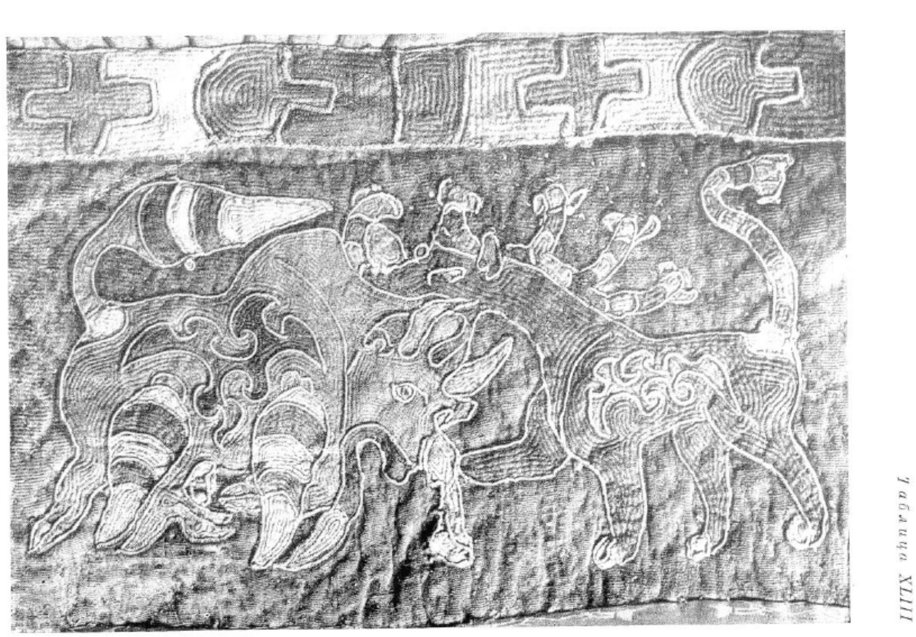

Figure 3.11 Scene of mythic animals in combat on carpet from Kurgan 6 at Noyon Uul (image courtesy of Rudenko, 1962).

Yaks, horses, bulls, unicorns, ibex, dragons, and stags stare out from golden and silver plaques and ornaments recovered from the elite imperial cemeteries at Gol Mod, Noyon Uul, Duurliig Nars in northern Central Mongolia, and Tsaram and Il'movaya Pad' in Transbaikalia.

Figure 3.12 Two forward-facing yaks (or bulls) on belt plaque from Grave 13 at Terezin (image courtesy of Kulinovskaya and Leus, 2018).

Figure 3.13 Forward-facing yak or ox belt plaque from Ala-Tey (image courtesy of Kulinovskaya and Leus, 2018).

Figure 3.14 Round silver plaque of a yak from Kurgan 6, Noyon Uul (circumference = 13.5 cm; image courtesy of Elikhina, 2017).

Figure 3.15 Golden horse decoration from the Ballod Kurgan, Noyon Uul (3.5 cm in length; image courtesy of Elikhina, 2017).

Figure 3.16 Fragment of belt buckle in shape of horse in profile from Grave 23, Ala-Tey (image courtesy of Kulinovskaya and Leus, 2018).

Figure 3.17 Belt buckle depicting two horses in combat from Grave 47, Ala-Tey (image courtesy of Kulinovskaya and Leus, 2018).

Figure 3.18 Belt plaque depicting two Bactrian camels in profile from Grave 21 at Ala-Tey (image courtesy of Kulinovskaya and Leus, 2018).

Figure 3.19 Silver and iron plaque depicting a stag (or horned cervid) from Kurgan 6 at Noyon Uul (6 cm in length; image courtesy of Elikhina, 2017).

Figure 3.20 Silver and iron belt piece depicting an ibex or goat running from Grave 24 at Tamiryn Ulaan Khoshuu (image courtesy of Törbat and Crubézy, 2022).

Figure 3.21 Unicorn plaque from Grave 20 at Gol Mod (image courtesy of Turbat, 2013).

Figure 3.22 Multiple unicorn plaques from Grave 20 at Gol Mod (image courtesy of Turbat, 2013).

Figure 3.23 Tiger in profile, gold leaf inlaid with turquoise and other semiprecious stone: belt plaque from Grave 9 at Ulaan Shiver (image courtesy of Erdenebold et al., n.d.c).

Figure 3.24 Two round plaques or decorations depicting snarling dragons from Tomb 20 at Gol Mod 1 (image courtesy of Turbat, 2013).

Frogs, fish, and birds on the wing populate embroidered textiles, along with horses and riders. Wooden figures of partial animal figures recovered from the graves suggest the anatomies and dispositions of deer and horses. One would be forgiven for thinking that animals real and imagined entirely dominated Xiongnu aesthetics.

Xiongnu material culture features creative depictions of nonhuman animals. Representations of nonhuman animals in Xiongnu mortuary assemblages sometimes deployed imitation and synecdoche to striking effect. Two examples from the elite imperial necropolis at Noyon Uul in Central Mongolia illustrate how Xiongnu aesthetics played with the lines between representation and presence. The first is a ceiling hanging embroidered to evoke yellow-and-black striped tiger skins stitched together, complete with 'heads' attached. While hardly a naturalistic imitation, the ceiling hanging gestures at actual tiger pelts, which decorated the halls of power in eastern and Inner Asia in historical records.

Figure 3.25 Photo of detail of "tiger pelt" textile from Grave 6 at Noyon Uul (image courtesy of Andreeva, 2018).

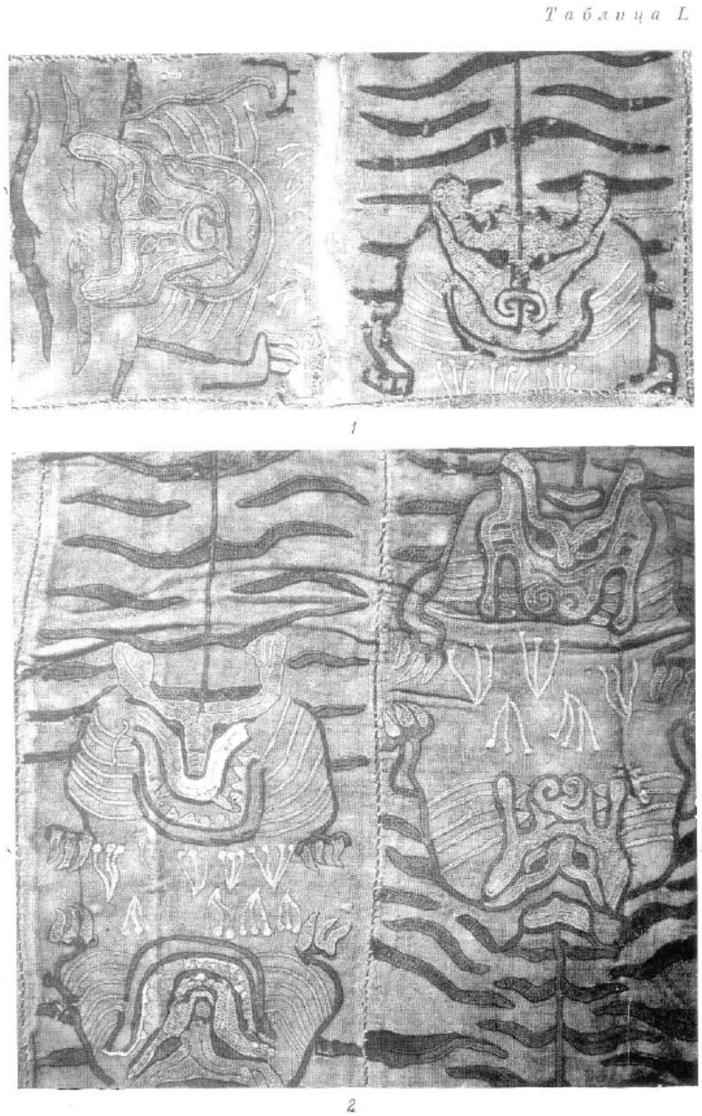

Figure 3.26 Photos of the “tiger pelt” textile from Grave 6 at Noyon Uul (image courtesy of Rudenko, 1962).

The second example comprises four lacquered wooden table legs recovered from Noyon Uul’s Kurgan 6. Each wooden leg was expertly carved to embody the distinctive morphology of equid metapodials (horse lower limb bones: Trever, 1932). These wooden table legs do not depict a whole horse, a complete horse’s leg, or even a horse’s complete skeletal limb. Rather, they embody a particular part of a horse that would be familiar and meaningful to those who lived closely with horses. These equid metapodial table legs indicate first-hand knowledge of horses on the part of the artisans as well as their intended audience consistent with the experiences and interests of mobile pastoralists.

Figure 3.27 Lacquered table legs carved in the shape of equid metapodials (horse cannon bones) from Kurgan 6 at Noyon Uul (image courtesy of Elikhina, 2017).

Figure 3.28 Drawing of a horse's right metacarpus (metapodial of foreleg; image courtesy of Sisson and Grossman, 1975).

From representations of the real (domesticated and wild) and the imagined (dragon, unicorn, griffin) to the use of animal materials in varied and creative instantiations, Xiongnu material culture evinces an aesthetic preoccupation with nonhuman animals that indicates their importance to Xiongnu regimes of value. The context in which most of these objects representing or using nonhuman animals were placed by the Xiongnu informs their significance to Xiongnu ideology. The majority of these animal materials and animal representations come to us from Xiongnu tombs, which will be the focus of the following chapter.

3.6 Conclusion

Those who view the Xiongnu from outside – Han contemporaries and later scholars across time and space – have relied heavily on mobile pastoralism to construct the Xiongnu and their empire into intelligible objects of analysis. Empirical evidence suggests some material reality to these constructions. As discussed in the preceding passages, direct and indirect evidence from textual sources and the archaeological record supports the interpretation that mobile pastoral lifeways were practiced within the Xiongnu Empire. Taken together, these lines of evidence indicate that mobile pastoralism should be crucial to scholarly understandings of these first imperial nomads.

Add to this inference the question of what mobile pastoral lifeways meant for the Xiongnu themselves. The consistent inclusion of domesticated herd animal remains in Xiongnu tombs embody direct evidence that livestock, a foundational component of any mobile pastoral lifeway, were key in Xiongnu mortuary ritual. Archaeologists have drawn attention to the consistent, intentional deposition of domesticated herd animal remains in Xiongnu tombs throughout decades of Xiongnu archaeology (see Dorjsüren, 1961; Törbat, 2004; Regzen and Batbold, 2007; Miller et al., 2018). Yet this phenomenon has remained undertheorized and underexplored in Xiongnu archaeology. Textual evidence identified by Honeychurch suggests that the Xiongnu imperial project may have operated by mobilizing a political subjectivity across strata comprising the empire into a cohesive political community: mobile pastoralists leading mobile pastoral lives.

The above described archaeological and textual evidence should prompt scholars to expand their vision of mobile pastoralism among the Xiongnu beyond the realms of political economy and daily life into values, beliefs, and logics powering ideological and political dynamics of the empire. An obvious path from this conclusion is to examine the nonhuman animals (especially livestock/domesticated herd animals) consistently buried with humans and material culture by living Xiongnu. Such an approach necessitates consideration of Xiongnu tombs themselves – their production through mortuary ritual and the anthropological significance of their typologies – and how archaeologists have used them and their contents to theorize the socio-political organization, history, and dynamics of the Xiongnu Empire.

CHAPTER 4

EMPIRE OF THE DEAD: THE FOUNDATIONAL ROLE OF THE TOMB AND ITS CONTENTS IN XIONGNU ARCHAEOLOGY

4.1 Introduction

Nonhuman animals abound in Xiongnu worlds of the living and the dead. They were described in Chinese texts[27], embroidered on wall hangings, carved into tools found in earthen-walled settlements, and laid to rest – in part or whole – in and around mortuary contexts across the Mongolian Plateau. The animals recovered from Xiongnu tombs and ritual contexts are most frequently sheep, goats, cattle, and horses – four of the five muzzled beasts that are essential to mobile pastoral ways of life in Inner Asia past and present together with Bactrian camels. Chapter 2 argued that mobile pastoralism and the human-animal relationships that constitute its core have shaped scholarly understanding of the Xiongnu Empire from its earliest articulations as an object of analysis. Current interpretations of the Xiongnu Empire characterize mobile pastoralism as the polity's fundamental mode of production and a driving force in the lives of its constituent communities. Although the mobile pastoral mode of production depended upon animals, the linkages between everyday practice and Xiongnu imperial politics are not well-

[27] But discussion of nonhuman animals in the Xiongnu world cannot be claimed as abundant in comparison with their political successors, the Xianbei (Xianbi): "[r]eferences about the auspicious meaning of animals in the rites and customs of the Xianbei, however, is [sic] much more abundant compared to the extant records of the Xiongnu. The 'Treatise on Auspicious and Inauspicious Influences" (Lingzheng zhi 靈徵志) in the *Weishu* is divided into two separate sections (*shang* 上 and xia 下), the later segment of which (*xia* 下) lists the occurrences of auspicious events related to the sudden appearance of the following animals: spirit animal, (*shenshou*), female unicorn (*qin*), turtle (*gui*), large elephant (*juxiang*), foxes (*hu*), five-colored dog (*wuse gou*), white deer, one-antlered deer, one-horned animal, white wolf, rabbit, and more than ten kinds of different birds" (Andreeva, 2018: 248).

understood (Di Cosmo, 1994, 1999; Kradin, 2005; Sneath, 2007; Barfield, 2011; Makarewicz, 2011).

However, the Xiongnu consistently interred nonhuman animals, especially livestock, in their mortuary spaces. Archaeologists widely understand this phenomenon as empirical evidence of the fundamental role that domesticated herd animals and mobile pastoral lifeways played across economic, political, social, and ideological spheres of Xiongnu society and empire. What often goes unsaid or undertheorized is that those five muzzled beasts (or their constituent parts) were deliberately placed with human beings. Living Xiongnu consistently assembled domesticated herd animal and human remains together in their tombs (through mortuary ritual), meaning that the Xiongnu deliberately associated livestock and humans in their mortuary spaces. Such consistent associations in ideologically- and symbolically-charged spaces suggest that Xiongnu cosmologies, ritual, and politics drew on the human-animal relationships fundamental to their mobile pastoral way of life. Together these phenomena indicate that the Xiongnu engaged in human-animal (or multispecies) relationships that encompass social, economic, and ideological dimensions of daily life and the afterlife. If the Xiongnu employed a pastoral mode of subsistence and consistently interred domesticated herd animals (along with other nonhuman animals) together with humans in their mortuary spaces (Brosseder, 2009; Martin et al., 2010; Delgermaa and Hite, 2010; Makarewicz, 2011; Martin, 2011; Miller et al., 2018; Hite n.d.a,b), that indicates that Xiongnu human-animal relationships encompassed economic, social, and ideological dimensions of daily life and the afterlife. Extending and synthesizing previous archaeological inquiry into the Xiongnu strongly suggests that interspecies entanglements or human-animal relationships that constitute a mobile pastoral way of life suffused the Xiongnu Empire, and were deeply significant to the Xiongnu themselves.

The Xiongnu mortuary contexts at the center of this project are ring burials (see below) that comprise the Elst Ar cemetery in Bulgan province, Central Mongolia (Erdenebold et al., n.d.a,b). Thus, the project focuses upon who was buried in 'more modest' tombs: the ring burials found in ring-only cemeteries and in cemeteries that also include the 'ostentatious' monumental tombs. The dataset at the heart of this project derives from ring tombs, what Tsagaan Törbat calls the tombs of "ordinary Xiongnu"[28], at a small Xiongnu cemetery comprised only of these 'modest' burials through combined bioarchaeological and zooarchaeological analyses. Such 'modest' ring tombs from a smaller, ring-only cemetery offer an empirical avenue into local and community scales of Xiongnu imperial society that may contribute to ongoing discourse about the differential, intersecting scales and spheres of Xiongnu political life.

Despite over a century of archaeological investigation of Xiongnu mortuary contexts and Xiongnu archaeology's expansion to other methodologies and datasets, the Xiongnu tomb and the materials it holds remain central to archaeological understanding of the Xiongnu and their empire. Moreover, both previously excavated Xiongnu tombs and those not yet excavated or identified hold great potential for expanding and enriching the archaeological imagination because scholars have not exhausted their interpretive potential as ideologically-charged spaces. This project builds upon a major tradition in archaeological knowledge production about the Xiongnu by explicitly framing Xiongnu tombs as extremely valuable sources of empirical data about the Xiongnu, their society, and their empire due to the nature of mortuary space and its production.

[28]Törbat (2004) translates *Khünnügiin jiriin irgediin bulsh* (Хүннүгийн жирийн иргэдийн булш) as "tombs of the ordinary Xiongnu". The key phrase is *jiriin irged* (жирийн иргэд); *jiriin* meaning "common, ordinary" and *irged* is the plural of *irgen* (иргэн) meaning "commoner, citizen, people" (Bawden, 1997). In addition to Törbat's translation, it would be plausible to translate the phrase as commoners or common people, making ring tombs the tombs of Xiongnu commoners or common people.

Archaeological excavations of Xiongnu mortuary contexts across the Mongolian Plateau reveal whole skeletons or partial osteological remains of horse, sheep, goat, cattle, and (Bactrian) camel in burials alongside single or multiple humans (Batsaikhan, 2003; Törbat, 2004, 2006; Minyaev, 2007, 2009; Miller, 2009; Brosseder, 2009; Martin et al., 2010; Martin, 2011; Plasteeva et al., 2017; Miller et al., 2018). As Miller and colleagues posit, "[t]he prevalence of domesticated animal remains adjacent to, or within, Xiongnu graves not only reflects the primarily pastoral orientation of the Xiongnu economy, but also strongly suggests that animal sacrifice constituted a central component of Xiongnu mortuary customs, and intimates a corpus of beliefs centered on livestock" (2018: 1313). The dearth of zooarchaeological analyses of Xiongnu mortuary assemblages is surprising given the consistent recovery of nonhuman animal remains from Xiongnu tombs, making the exceptions particularly valuable (see Crubézy et al., 1996; Martin et al., 2010; Makarewicz, 2011, 2015; Martin, 2011; Miller et al., 2018). Archaeologists have noted the significance these consistent associations of humans and domesticated herd animals in Xiongnu mortuary contexts, and generally interpreted them as evidence for the primacy of mobile pastoralism to imperial religion, cosmologies, and/or ideologies enacted in mortuary ritual (Dorjsüren, 1961; Batsaikhan, 2003; Makarewicz, 2011; Martin, 2011; Miller et al., 2018). Those interpretations rest on the recognition of the tremendous importance of Xiongnu tombs to archaeologists and to the Xiongnu themselves.

4.2 The Eternal Significance of Xiongnu Tombs

Most of what we know about the Xiongnu as an archaeological object of analysis comes from Xiongnu tombs: their material qualities (organized into typologies), temporo-spatial distribution, and contents. Thousands of Xiongnu tombs have been documented across the temporo-geographic span of the Xiongnu archaeological culture. Archaeologists extensively draw on these materials from Xiongnu tombs and other qualities of Xiongnu tombs, such as their temporo-spatial distribution and surface features (organized into typologies), to generate models and hypotheses of Xiongnu social organization, political dynamics within the imperium, and relationships of exchange with other polities and groups.

The excavation of mortuary contexts and analysis of their contents have dominated Xiongnu archaeology from the field's beginnings into the present. In *Inner Asia and the Spatial Politics of Empire*, Honeychurch encapsulates the centrality of tombs and their contents to Xiongnu archaeology, writing that, "[o]f all Xiongnu-period site types, burials and cemeteries are by far the best known and the most studied" (2015: 227). It is therefore unsurprising that the bulk of Xiongnu archaeological data derives from mortuary contexts because Xiongnu archaeology has focused on mortuary contexts since the onset of its 'long century'. However, the great number of Xiongnu tombs thus far discovered and their vast geographical distribution strongly implies that mortuary ritual and the place-making activities imbricated therein were in fact a crucial dimension of the Xiongnu imperial project.

4.2.1 Xiongnu tomb typology: ring vs. platform burials

The most extensively excavated and research Xiongnu mortuary contexts are the two primary forms of elite burial: ring tombs and terrace tombs. Archaeologists generally describe the rock-ring elite mortuary contexts as circular or ring burials; the monumental elite mortuary contexts are referred to as terrace tombs (Brosseder, 2009), platform tombs (Honeychurch, 2015), square tombs (Miller, 2014), or ramped tombs.

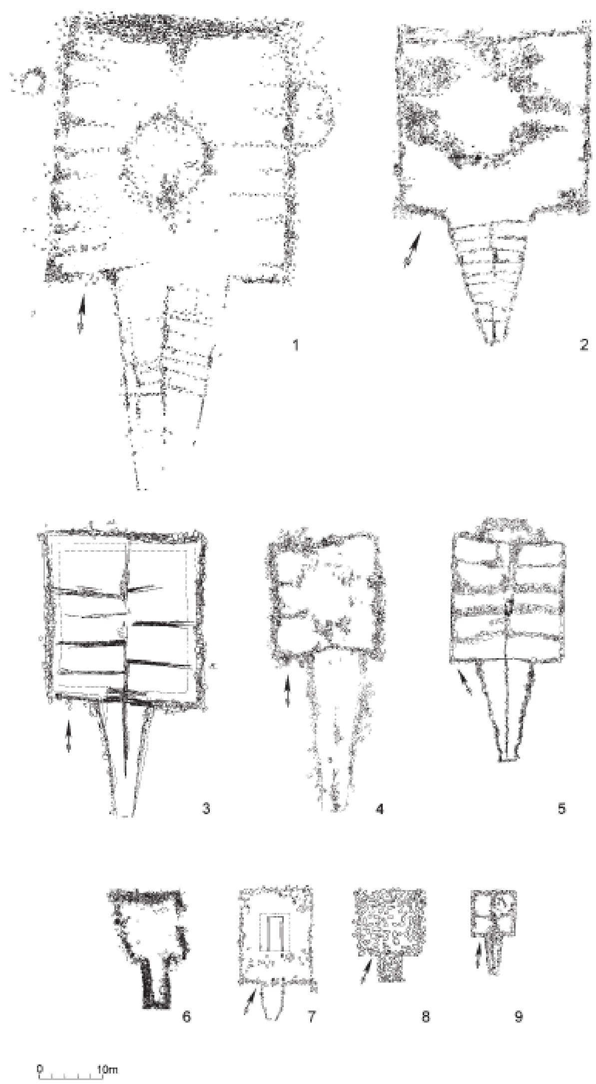

Figure 4.1 Birdseye view plans of Xiongnu platform tomb surface features. 1) Gol Mod 2, Tomb 1; 2) Gol Mod 1, Tomb 20; 3) Tsaram, Kurgan 7; 4) Noyon Uul, Tomb 20; 5) Il'movaya Pad', Sudzha, Tomb 54; 6) Gol Mod 1, Tomb 79; 7) Takhiltyn khotgor, Tomb 82; 8) Takhiltyn khotgor, Tomb 83; 9) Takhiltyn khotgor, Tomb 64 (image courtesy of Brosseder, 2009).

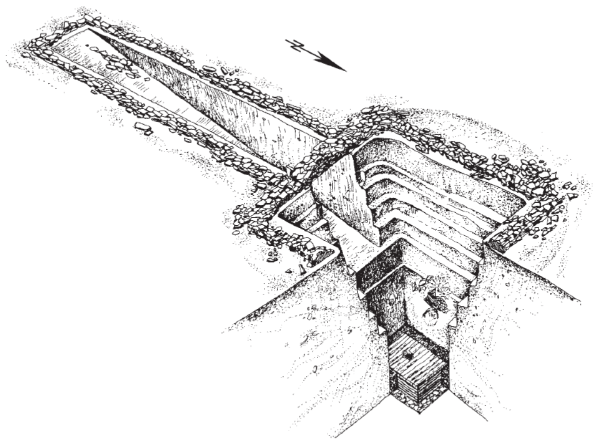

Figure 4.2 Cross-section drawing of a monumental platform tomb (Tomb 20) at Noyon Uul after excavation (image courtesy of Brosseder, 2009).

Figure 4.3 Birdseye photograph of monumental platform tomb surface feature at Duurlig Nars cleared of ground vegetation and soil (image courtesy of Turbat, 2013).

Fig. 11. Noyon Uul, tomb 20. Stone layers covering the burial pit. 1 first stone layer; 2 second stone layer; 3 second and third stone layer; 4 fourth stone layer (1–4 Polos'mak et al. 2008, 80, Fig. 6–7; 81, Fig. 8–9).

Figure 4.4 Photographic series of excavating a monumental platform tomb (Tomb 20) at Noyon Uul (image courtesy of Brosseder, 2009).

Figure 4.5 Photograph of monumental platform tomb (Tomb 31) at Noyon Uul fully excavated to reveal the coffin (image courtesy of Turbat, 2013).

Honeychurch encapsulates the binary typology of Xiongnu tombs by describing the "two primary forms of elite burial during the Xiongnu period: one with an embanked ring feature made of stone and soil, and the other with a large platform-like mound and several levels of deeply interred construction (Miniaev, 1985). Both were labor intensive and contain imported items, precious materials, and have prominent cemetery locations. Of these two, the smaller and more widespread form is the Xiongnu-period "ring" burials (Konovalov, 1976; Tseveendorj, 1985; Törbat, 2004). These have substantial ring features on the surface measuring up to 14 m in diameter and below this ring of stones are pit interments ranging from 1.5 to 4 m in depth" (2015: 227-228).

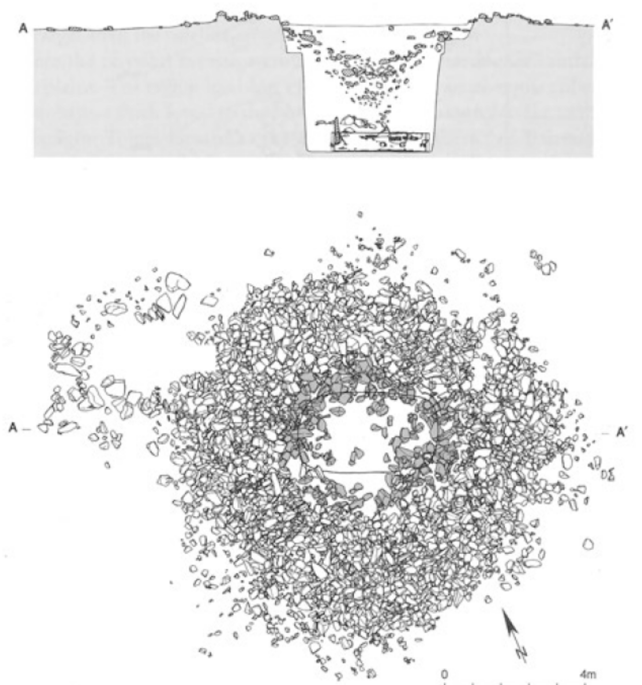

Figure 4.6 Drawings of a ring tomb (Grave 1) at Khudgiin Tolgoi: cross-section of tomb and plan of its cleared surface feature (image courtesy of Honeychurch, 2015)

Figure 4.7 Photograph of uncleared Xiongnu ring tombs at Tamiryn Ulaan Khoshuu (image courtesy of Turbat, 2013).

Figure 4.8 Photograph of a cleared Xiongnu ring tomb's surface feature at Tamiryn Ulaan Khoshuu (image courtesy of Purcell and Spears, 2006).

Figure 4.9 Photograph of a cleared Xiongnu ring tomb's surface feature at Baga Gazryn Chuluu (BGC; image courtesy of Turbat, 2013).

Figure 4.10 Photograph of nearly-completely excavated of Xiongnu ring tomb at Baga Gazryn Chuluu (BGC: author's own image).

What archaeologists often class as 'elite' Xiongnu cemeteries comprising platform or terrace (and often ring) tombs generally contain between a dozen and several hundred graves (Törbat, 2004; Brosseder, 2009; Honeychurch, 2015). These sites are highly visible and often contain large, well-preserved mortuary assemblages, rendering them early and continuing sites of archaeological inquiry in Mongolia, Siberia, and northern China. Comprised largely of mortuary contexts, the archaeological record from the Xiongnu imperial heartland of Central Mongolia and bordering areas of southern Siberia to the north (but see Bemmann, 2011). This Xiongnu imperial heartland includes well-known necropolises from the Middle Gobi in the south (the Baga Gazryn Chuluu archaeological landscape in Dundgov' *aimag*) north through the *khangai* ecozone (e.g., Burkhan Tolgoi in the Egiin Gol archaeological landscape; Noyon Uul; Gol Mod; Naimaa Tolgoi; Tamiryn Ulaan Khoshuu), and upward into southern Siberia (e.g., Derestuy; Tsaram; Il'movaya Pad').

Figure 4.11 Map of Mongolia within Inner Asia, including Xiongnu archaeological landscapes and cemeteries discussed in the text (image modified from Honeychurch, 2015).

4.2.2 Reconstructing Xiongnu imperial society and its transformations from the tombs

Archaeological investigations of Xiongnu mortuary contexts have yielded key information on the 'political communities' (Honeychurch, 2012) comprising the imperial project. Mortuary datasets inform theories of exchange of ideology and material culture across vast geographic distances and cultural boundaries; Xiongnu societal structure, ethnogenesis, and mortuary ritual; regimes of value created and deployed by power brokers in a muli-scalar political system; and the significance of mobile pastoralism to ritual practice and social life (Erdenebaatar et al., 1999; Erdenebaatar, 2000; Kradin, 2005; Brosseder, 2009; Miller, 2009;

Minyaev, 2009; Makarewicz, 2011; Honeychurch, 2015; Miller and Brosseder, 2017). Some archaeologists argue that Xiongnu mortuary contexts are evidence of a hierarchical polity with elites in the largest, richest burials (Batsaikhan, 2003; Kradin, 2005; Minyaev, 1985, 2009). Other archaeologists present Xiongnu mortuary contexts as sites of active contestation and negotiation in a political culture of competing scales (Miller, 2014), where palimpsests of ritual activities, seen in 'sacrifice' features and other ritual contexts, play a role in the creation of Xiongnu imperial value, ideology, and authority (Brosseder, 2009; Miller, 2009; Miller and Brosseder, 2017).

The archaeological evidence from the Xiongnu burials located in the imperial heartland contrasts to the historical narrative in which the Xiongnu Empire rose out of geopolitical turmoil and violent conflict (see Di Cosmo, Kradin, and Barfield discussed in Honeychurch, 2015; Honeychurch and Amartuvshin, 2011). The kind of bioarchaeological evidence that might be interpreted as resulting from interpersonal violence or warfare is largely lacking from the human remains recovered from Xiongnu tombs. Instead, mobile pastoral communities in regions spanning Central Mongolia appear to have engaged in complex, multi-scalar political dynamics devoid of systemic violence or societal upheaval that 'leveled up' into an imperial project (see Chapter 2; Honeychurch, 2015; Miller and Brosseder, 2017). These observations helped prompt critical inquiry into the socio-political organization of the Xiongnu Empire thought to be dominated by the *shanyu* and the elite stratum of imperial society he represented.

Recent research has moved away from the long-standing focus on the upper echelons of imperial society in historical and archaeological knowledge production about the Xiongnu. As Bryan Miller points out, "[a]rchaeological endeavors have also customarily devoted disproportionate attention to the uppermost echelon of the Xiongnu through studies focused on the largest ostentatious tombs and more opulent goods. (Miniaev and Sakharovskaia 2007; Shinjlekh et al. 2011; Polos'mak et al. 2011) Although these portions of the archaeological record provide substantial evidence for elite high culture and long-distance interaction, they do not relate evidence of the lives of local elites or the vast constituents of the steppe empire that supported the imperial rulers supposedly interred in the monumental tombs" (Miller, 2014: 3). To this end, Miller (2014) compared archaeological and historical evidence for local and regional elites jockeying for power under the overarching aegis of the *shanyu* and aristocratic rulers of the imperium. Miller excavated a significant body of evidence from Chinese historical sources about the Xiongnu, even though "the Chinese chroniclers at court appear most concerned with politics of the steppe imperial nobility and their effects on the Han frontier. Yet, from information scattered throughout court histories and frontier documents, one may glean a growing crucial presence of powerful leaders, whom Chinese chroniclers relegated to categories such as "name kings" and "frontier kings," as well as a persistent presence of mid-level leaders ranging from Chiefs of Thousands and Hundreds to lesser Chiefs of Tens. A greater attention to such agents helps demonstrate the critical roles that leaders of all sorts outside the imperial nobility played not only in inciting political crises but also in inducing political developments" (2014: 15).

While the contours of political categories like 'regional elites', 'local chiefs', and 'kings' are under debate, the recent shift in perspective on the Xiongnu polity highlights the analytical power and empirical necessity of a more nuanced, interior view of the multiple scales of Xiongnu political life. Initially archaeologists focused their attention on the monumental platform tombs of the Xiongnu archaeological culture. As discussed in Chapter 3, the proto-archaeologists who explored the mortuary contexts in southern Siberia starting in the late 19^{th}

century, followed by early archaeologists working in Central Mongolia in the first decades of the 20th century, would come to identify the monumental platform tombs and their spectacular contents with the group described in Chinese historical records as the Xiongnu. Subsequent archaeological investigation would lead scholars to identify these platform tombs as constructed by the same archaeological culture as the ancient people who constructed what we now call ring tombs (such as those comprising the cemetery at Elst Ar).

But research by Ursula Brosseder and Bryan Miller suggests a major divergence between the textual and archaeological records of the Xiongnu Empire manifest in mortuary assemblages and space. They argue that mortuary datasets from across the Xiongnu imperial sphere of influence feature a dramatic shift around the end of the first millennium BCE (Brosseder, 2009; Miller and Brosseder, 2017). In Brosseder and Miller's hypothesis, the first period of Xiongnu archaeological culture begins with ring tombs in the 4th century BCE (Miller, 2009), and that after 100 BCE a second period begins with increasingly standardized interment practices, new monumental forms of tomb construction, and sudden plethora of prestige 'foreign' objects comprising mortuary assemblages (Brosseder, 2009; Miller and Brosseder, 2017). These analyses posit that a significant shift in political culture was responsible for the observable changes in Xiongnu mortuary contexts (Miller, 2009, 2014; Miller and Brosseder, 2017).

Other archaeologists of the Xiongnu Empire express reservations about the empirical basis for this chronological argument (Honeychurch, 2015) or interpret Xiongnu mortuary assemblages through the framework of ethnogenesis and ethnocultural affiliation (see Törbat, 2006, on Dorjsüren, Tseveendorj, and other prominent Mongolian archaeologists known for their study of the Xiongnu). If the Xiongnu archaeological culture does indeed comprise two distinct periods demarcated by an empire-wide political sea change, that seismic shift in imperial politics went largely elided in Chinese texts (Brosseder, 2009). Even the texts that comprise the Chinese historical record, Miller argues, "demonstrate not an irreparable decay in the late first century BC, a view that emerges from the sinocentric [sic] nature of the written sources, but rather a resurgence of Xiongnu power in the steppes which lasted through the first century AD (Miller 2009: 125 ff.). Furthermore, increased investments in demonstrations of power, seen in ostentatious tombs and opulent goods (discussed below), were a result of intensifying competition between supra-regional and regional elites over the course of the early centuries of the Xiongnu Empire, which culminated in a bifurcation of the steppe elite in the later period and the further elevation of ruling components of the steppe empire. Changes in material culture and social practices in the steppe empire may thus be understood through an expanded consideration of political agents both amongst the imperial elites and those outside this uppermost echelon" (2014: 16). The hypotheses put forth by Brosseder and Miller represent the push to reconsider the political dynamics and organization of the Xiongnu Empire, where a static vision of sociopolitical hierarchy in previous scholarship is challenged by evidence for a vibrant political arena where political agents and communities competed and collaborated across multiple scales of Xiongnu imperial society.

Brosseder and Miller's work underscores that societal processes, dynamics, and events may manifest in the material record with little or no trace in the textual record. Archaeologists might consider whether there are whole spheres of Xiongnu imperial society only detectable in their domain of analysis. In a similar vein, the above-discussed perspective shift in Xiongnu archaeology away from a rigid hierarchical structure defining the imperial polity to a more complex vision of competing, intersecting scales of political life owes a significant debt to archaeological knowledge production. What other productive insights might archaeologists have into the Xiongnu as an empire, society, and/or archaeological culture by attending closely to the material record in novel ways?

4.2.3 Troubling Xiongnu tomb typology

Despite their centrality to archaeological knowledge production about the Xiongnu, key aspects of Xiongnu mortuary contexts remain contested. Archaeologists do not entirely agree that both 'elite' Xiongnu tomb types – ring burials and terrace tombs – represent elite contexts. This is particularly true for Xiongnu ring tombs. As noted above, Törbat (2004) literally refers to ring burials as the tombs of ordinary Xiongnu in his eponymous work. Similarly, prominent archaeologist of the Xiongnu Sergei S. Minyaev[29] describes these mortuary contexts as holding the remains of the "rank-and-file" (1985). Wright (2021) echoes this hierarchical division of ring burials into ordinary tombs and platform or terrace mounds as elite tombs.

In her foundational analysis of the platform-like mound (or terrace) tombs, Ursula Brosseder (2009) emphasizes two different types of Xiongnu cemeteries: those comprised of both ring burials and platform or terrace tombs, and those comprised only of ring burials. Brosseder's rigorous examination of Xiongnu elite tombs (in her case, platform or terrace tombs) reveals that tomb construction methods and mortuary assemblages varied greatly within this category of elite mortuary context, finding that "terrace burials – despite their similar rectangular layout – cannot be interpreted as one single homogeneous group" (2009: 256). Available evidence dates the phenomenon of Xiongnu platform or terrace burials to the first century BCE through the first century CE/AD (Honeychurch, 2015; Wright, 2021), although this phenomenon may be

[29]Миняев is sometimes transcribed as "Miniaev".

influenced by the limited number of excavated platform tombs and lack of absolute dates for those that have been excavated (Brosseder, 2009). Honeychurch further posits that different strata of Xiongnu imperial elites were buried in ring and platform tombs, respectively (2015).

Further empirical evidence from Xiongnu mortuary contexts troubles the ring-platform burial typology. Archaeologists note significant overlap between mortuary assemblages and interior tomb layout occur between smaller terrace tombs and ring tomb categories; hierarchies of size and inventory within the platform tomb category; the richness of so-called 'commoner' burials (i.e., the ring burials); and the existence of Xiongnu tombs with little to no observable surface features that do not fit either the platform or ring tomb categories (Brosseder, 2009; Brosseder and Miller, 2011; Miller, 2014). These phenomena index the heuristic character of the ring-platform tomb typology in Xiongnu archaeology, raising questions about how archaeologists conceptualize the actual Xiongnu – subjects and *shanyu* alike – interred in these tombs based on this typology. Might a targeted investigation of Xiongnu mortuary materials reveal forms of subjectivity and sociality within the imperium not captured by the 'commoner' ring tomb vs. 'elite' platform tomb dichotomy?

4.2.4 Dealing with the disturbances to Xiongnu tombs

The taphonomic evidence for the widespread re-opening and destruction of Xiongnu elite burials, particularly the monumental platform tombs, represents another challenge for archaeological interpretation embedded in Xiongnu mortuary datasets. Often the re-opening of tombs is interpreted as 'looting', but Brosseder contends that "[e]ven though we do not have data yet to determine the point of time when those tombs were reopened it is reasonable to argue that this process did not take place very long after the burial ceremony since the burial chamber must still have stood when the opening had taken place in order to remove objects" (Brosseder, 2009: 267). Whatever the social logics and context of the reopening of Xiongnu tombs, a tomb's internal organization is often lost or highly disturbed and originally-interred objects and body-parts may have been removed. The disrupted nature of most excavated Xiongnu tombs has posed a significant interpretive challenge to the archaeological imagination. Yet not only do Xiongnu mortuary contexts provide the majority of empirical data on the Xiongnu as an archaeological object of analysis, even 'looted' tombs hold further potential for our understanding of the Xiongnu.

First, certain materials deliberately placed into Xiongnu tombs by living Xiongnu contain crucial information even when many contextual data are lost to archaeologists or some of those materials are absent. These materials are, in particular, the bones, teeth, horncore, antler, and other durable bodily remains of humans and other animals. Whatever bones or teeth of a human being, sheep, or horse remain in a Xiongnu tomb to be discovered by archaeologists during excavation index the entire body of that once-living social being. For example, excavation of a Xiongnu tomb may reveal an intact cranium of *Ovis aries*: a sheep's skull. Whether the living Xiongnu deposited only that sheep skull, or included more (or all) of that sheep's body, the sheep's skull alone is material evidence of that complete, flesh-and-blood, bleating and grazing, once-living sheep. In other words, the human and nonhuman animal bodily remains in Xiongnu tombs may not represent the original, deliberate arrangements of once-living people and livestock within the tomb (including removal and possible addition of body parts), but whatever human and nonhuman animal remains found evidence the intentional inclusion of those once-living social beings even if just in part. That sheep's skull required the birth, lifetime, and then death of that sheep. This holds just as true for a human skull and a once-living person. This project will introduce a methodology (relational osteobiography) that operates on this basic reality (see Chapter 6).

Second, the Xiongnu tomb holds further analytical potential when understood as a deliberate enactment of a Xiongnu category. Regardless of later disruption, each Xiongnu tomb is the intentional creation of mortuary space bounded into a discrete unit. The repetitions in construction techniques, surface feature morphology, orientation and positioning of the human deceased, and material assemblage reinforce the idea that a Xiongnu tomb was a category or unit created and used by the Xiongnu themselves. The Xiongnu tomb may be as near as analysts can come to an emic category of the Xiongnu. That archaeologists have access to a culturally-specific category represents a potent avenue for investigating that culture on its own terms. Despite taphonomic issues, Xiongnu burials yield a wealth of materials in contrast to the relatively sparse assemblages from Xiongnu ephemeral habitation contexts. While survey and habitation context data now expand archaeological understanding of the Xiongnu empire, as discussed above, mortuary datasets contain humans, nonhuman animals, and an array of objects intentionally assembled through mortuary practice. As the mortuary practices are the embodiment and vehicle of sociopolitical authority and transformation, serving as a "locus for legitimation of a social order, or for struggle and contestation of one" (Robb, 2007: 287), continued attention to Xiongnu mortuary spaces, practices, and assemblages finds ample justification. The importance of the Xiongnu tomb is not limited to archaeological knowledge production about the Xiongnu. The Xiongnu demonstrated the value they placed on their tombs and the activities that produced them given how the Xiongnu constructed these tombs repeatedly across the temporo-geographic expanse of their empire. Moreover, mortuary space and its production represent realms of social life imbued with heightened ideological, symbolic, and political significance for a given society.

4.3 Mortuary Ritual and The Production of Xiongnu Tombs

The nature of mortuary space and practice provides a solid basis for understanding that tombs were extremely important to the Xiongnu. Tombs are forms of mortuary space generated through mortuary practice or ritual, thus imbued with heightened meaning and significance. Mortuary space carries potent ideological, cosmological, symbolic, and political weight for any society (Trinkaus, 1984). Although permeated by values, beliefs, and logics that may be unconscious or implicit, the production of mortuary space itself is deliberate and intentional. The production of mortuary space involves intentional social action through mortuary ritual, as mortuary ritual is a crucial moment of social reproduction (Yao, 2017: 100). Both constructing a tomb and assembling objects, people, and nonhuman animals (or their constituent parts) to place into the tomb are all intentional activities. Mortuary ritual – the collective social action that results in a mortuary context – often reshuffles or even upends the social order, where mourners negotiate between representing how things ought to be and how things actually were.

Archaeologists and anthropologists have long been interested in mortuary ritual and space. "[S]ince mortuary rites involve manipulations of material culture, social relations, cultural ideals, and the human body, they represent a nexus of anthropological interests" (Rakita and Buikstra, 2005: 1). As a subset or subdiscipline within archaeology, mortuary archaeology devotes itself entirely to the analysis and interpretation of mortuary space as an empirical avenue into this nexus of anthropological interests. Mortuary archaeology has a long tradition of attempting to reconstruct societal organization and complexity through evidence from burials and cemeteries (see historical overviews in Binford, 1971; Parker Pearson, 1999; Rakita and Buikstra, 2005). Much of this work has delved into the performance and negotiation of individual identities within a social group along intersecting sociological axes of the human experience, or what Adam T. Smith called 'axes of difference' (2004: 3): gender, age, status within power structures (class), and ethnicity (or race, geographic origin, etc.). These axes form the interpretive bedrock of mortuary archaeological reconstructions of past societies and social worlds. Archaeologists use these 'axes of difference' to analyze the empirical evidence they generate from mortuary datasets in order to derive societal organization and dynamics, including but not limited to: kinship systems; territorial units and divisions; religious orders and ideological systems; division of labor, socioeconomic classes, mode of production; and so forth. The goal of such approaches is to bring the contours of a past social order into view (Parker Pearson, 1999).

However, mortuary archaeologists also recognize that mortuary ritual (and the production of mortuary space) is a social venture that does not so much mirror the social order perfectly but serves as an arena for contesting, negotiating, and playing with that social order. As the archaeologist Mike Parker Pearson writes in *The Archaeology of Death and Burial*, "[t]o understand funerary practices, archaeologists have now to consider that such events are representations of the perceived reality of social relations and are also open to conflict, negotiation, and misrepresentation. Funerals are moments when the structure of power may be radically reordered; they are not simply reflections of the social order" (1999: 86). Thus, what archaeologists encounter in mortuary space contains evidence of what the people who produced it believed their social world ought to be like, rather than a perfect reflection of their society.

Following this insight about mortuary space, we may understand Xiongnu tombs and their contents as imbued with Xiongnu beliefs and values enacted in mortuary ritual. This project thus frames Xiongnu tombs as contexts containing a rich source of information on powerful ideologies operating within Xiongnu society and the empire. This approach is distinct from but compatible with other framings of Xiongnu tombs (mortuary contexts and mortuary data) from which archaeologists generate interpretations of Xiongnu society and empire. In this project, the Xiongnu tomb (including its contents) is understood as resulting from collective social action in a ritual setting: mortuary practice. Therefore, what beliefs, logics, and values that living Xiongnu enacted, asserted, or contested in the arena of mortuary ritual should imbue the Xiongnu tomb and its materials. As a result, examining the materials that living Xiongnu assembled into their tombs offers fresh insight into potent ideologies at work within society and the empire.

4.4 Assembling Imperial Prestige: Fixing Materials in Xiongnu Mortuary Space

Of the materials comprising Xiongnu mortuary assemblages, transformed animal materials have received much more scholarly attention and interpretation in comparison to nonhuman remains. At this stage in Xiongnu archaeology, more attention has been paid to inorganic or processed organic (worked animal bone, textiles made from wool and other nonhuman animal fibers, etc.) materials comprising mortuary assemblages in comparison to portions of nonhuman animal bodies (Minyaev, 1985; Batsaikhan, 2003; Törbat, 2004; Brosseder, 2009; Honeychurch, 2015). This tendency is understandable, given the remarkable and often opulent nature of these materials, which include Han bronze mirrors; gold-plated belt plaques (see Fig. 3.23); woolen, felt, and/or silk wall hangings (see Figs. 3.10 and 3.11); vivid depictions of real and mythological animals in metal decorations (see Figs. 3.12-3.24); lacquered vessels; Chinese chariots; and beads, gold jewelry, glassware; and figurines from the Hellenic world, Egypt, and Western Asia (see also Chapter 3).

Figure 4.12 Intact Han bronze mirror recovered from Grave 100 at Tamiryn Ulaan Khoshuu (image courtesy of Törbat and Crubézy, 2022).

Figure 4.13 Fragments of a Han bronze mirror recovered from Gol Mod 1 (image courtesy of Yerool-Erdene and Gantulga, n.d).

Figure 4.14 Woolen carpet fragment from Grave 6 at Noyon Uul depicting a turtle and a fish (image courtesy of Elikhina, 2017).

Figure 4.15 Woolen textile fragment from Grave 6 at Noyon Uul depicting horses and riders (likely produced in Bactria; image courtesy of Elikhina, 2017).

Figure 4.16 Chinese lacquerware: a) Tomb 5, Noyon Uul; b) Tomb 23, Noyon Uul; c) inscribed vessel and detail from Tamiryn Ulaan Khoshoo; d) Tomb 6, Noyon Uul (image courtesy of Miller, 2009).

Figure 4.17 Blue glass vessel recovered from Satellite 30 at Gol Mod 2 (image courtesy of Turbat, 2013).

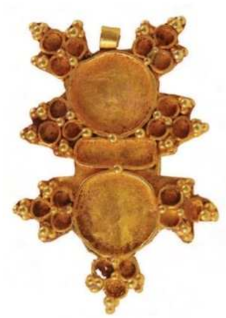

Figure 4.18 Golden earring from Grave 109 at Tamiryn Ulaan Khoshuu (image courtesy of Törbat and Crubézy, 2022).

Figure 4.19 Anthropomorphic stone statuette from Tomb 1 at Ikheriin Am, Baga Gazryn Chuluu, identified as the Egyptian deity Bes (image courtesy of Turbat, 2013).

'Foreign' objects in elite Xiongnu mortuary contexts (often dating to Brosseder and Miller's 'second' period) include Roman glassware (Fig. 4.17), jewelry from Byzantium (Fig. 4.18, a statuette of an Egyptian divinity (Fig. 4.19), Central Asia textiles (Fig. 4.15), and a dizzying array of Han Chinese prestige items (including but not limited to silk, silver-bronze mirrors, lacquer ware, and two-wheeled chariots). The presence of these objects in elite Xiongnu assemblages and Xiongnu objects found across broad expanses of ancient Eurasia indicate multiscalar political dynamics, wherein local elites incorporate 'global' goods into regimes of value that serve local ideological projects (Yao, 2012; Miller and Brosseder, 2017). The suspension of these circulated objects in mortuary assemblages appears to have been instrumental in Xiongnu projects of identity and sovereignty, suggesting that materialities played constitutive roles in the imperial project.

These prestige ‘global’ goods were always and intentionally assembled into mortuary space by the Xiongnu themselves along with nonhuman animal remains (and, of course, human remains). That both ‘prestige’ items and livestock body-parts were components of a wider whole – a mortuary assemblage – constituted through mortuary ritual remains underexplored as a window into Xiongnu mortuary practice and the ideologies at play therein. This elision results partially from the standard practices of archaeological knowledge production, which disarticulate those original assemblages along the lines of methodological and subfield boundaries: animal bones to the zooarchaeologist, human bones to the bioarchaeologist, metal objects to metallurgical specialists, and so forth. What might archaeologists learn about why the Xiongnu assembled these particular materials together if they put some of the pieces back together?

4.5 Tomb by Tomb, Cemetery by Cemetery: An Overview of Zooarchaeological Assemblages from Xiongnu Mortuary Contexts

Researchers have noted the inclusion and careful arrangement of domesticated animals in mortuary and ritual space for much of the ‘long century’ of Xiongnu archaeology (Dorjsüren, 1961; Rudenko, 1962; Batsaikhan, 2003; Törbat, 2004; Makarewicz, 2011; Martin, 2011; Miller et al., 2018). Livestock remains emerged from the first excavations of Xiongnu burials in Mongolia: multiple entire horse skeletons were recovered from monumental terrace tombs at the imperial necropolis at Noyon Uul, along with sheep and cattle osteological materials (Trever, 1932). As discussed in Chapter 3, previous archaeologists have argued that the specific details of this phenomenon – what kinds of livestock in terms of species (or taxon), their ages at death and skeletal sex; the overall number of livestock per tomb vs. their count by species (or taxon); and how each nonhuman animal was treated in death and in mortuary ritual – represent "one of the greatest – yet least explored – demonstrations of social politics" (Miller et al., 2018: 1312-1313). However, the observation of livestock remains in Xiongnu tombs as widespread fuels some important theories about the Xiongnu.

Some archaeologists argue for continuity between the Xiongnu and later historical groups in Mongolia and Inner Asia based on what they consider to be similarities in the use and appearance of domesticated herd animals in mortuary spaces (Crubézy et al., 1996; Batsaikhan, 2003). Others have forwarded the idea that the Xiongnu included livestock in their mortuary and ritual contexts as part of broader subsistence-maximizing pastoral strategies of production (Makarewicz, 2011). Germane to this project is Ts. Törbat's inference of patterns of association between domesticated herd animals (or their constituent parts) and humans (2004). Although later zooarchaeological analyses of nonhuman animal remains from Xiongnu tombs do not support his observation, Törbat opened the door for analyzing/treating human and nonhuman remains in Xiongnu tombs as intentionally put together, as parts of a larger whole assembled by living Xiongnu on purpose in mortuary ritual.

In more recent decades, zooarchaeological analyses of nonhuman animal remains from Xiongnu mortuary contexts at Burkhan Tolgoi (Egiin Gol: Crubézy et al., 1996; Martin et al., 2010; Martin, 2011), Gol Mod 1 (Martin et al., 2010; Martin, 2011), and Baga Gazryn Chuluu (Hite, n.d.a,b; Hite and Delgermaa, 2010; Johannessen and Hite, n.d.; Makarewicz, n.d., 2011) strongly suggest that complex human-animal relationships characterized life and death in the Xiongnu Empire, as evidenced by the variety of taxa and/or age classes recorded. Variation in the positioning of nonhuman animals in mortuary space, along with tomb construction and treatment of the body, suggests local ideologies and practices within the Xiongnu Empire maintained in spite of or in tandem with the material technologies of elite imperial politics. As Bryan Miller and Ursula Brosseder argue, "[d]espite the homogenous nature of the prestige assemblage and vessel traditions, however, different local rites and ritual arenas appear to have persisted. Although offerings of heads and hooves of livestock proliferated among the burials of Inner Asian steppe groups, the placement of these offerings, the burial structures and furnishings, as well as orientations and treatments of the body, differed greatly...Thus, while packages of prestige facilitated a symbolic entrainment of local magnates within a unifying culture of political power, beneath the veneer of a Xiongnu political culture, parallel practices of local social distinctions remained equally as robust" (2017: 473).

As described by Miller and Brosseder, Xiongnu mortuary practice was a domain of social life where living Xiongnu asserted, contested, and negotiated different regimes of value, belief, and power within the empire, with the dominant imperial scale operating through 'prestige' assemblages in contrast to local traditions of power and subjectivity. In this articulation of Xiongnu mortuary practice, the variation in livestock remains and their postmortem treatment in Xiongnu tombs across time and space comprise a significant component of those local traditions. Because 'local' variation in the numbers, types, and treatment of domesticated herd animal remains in Xiongnu mortuary contexts has not been closely or extensively analyzed, the logics of this practice are not clear at scales of a single tomb, cemetery, collection of cemeteries, or region within the Xiongnu Empire. Moreover, how this 'local' variation in numbers, types, and treatment of livestcok in Xiongnu tombs fits into the empire-wide phenomenon of interring domesticated animal remains an open question.

Several in-depth, tomb-scale zooarchaeological analyses of nonhuman animal remains from Xiongnu mortuary contexts provide detail on the broader Xiongnu pattern of intentionally interring domesticated herd animals in tombs. These analyses were conducted on assemblages from three well-studied archaeological landscapes in Central Mongolia: Gol Mod 1 and Burkhan Tolgoi (a cemetery located in the Egiin Gol archaeological landscape) in the *khangai* and Baga Gazryn Chuluu (BGC) in the northern Gobi desert region. Despite important differences in ecological zone, site environments, and Xiongnu tomb types, these three archaeological landscapes share a crucial quality: their location within the original core of the Xiongnu polity as well as the later imperial heartland. As detailed below, zooarchaeological analyses from Gol Mod 1, Burkhan Tolgoi, and BGC demonstrate intra- and inter-tomb variation when it comes to which kinds of domesticated herd animals and how they were interred in those Xiongnu tombs (Crubézy et al., 1996; Hite, n.d.b; Delgermaa and Hite, 2010; Makarewicz, n.d., 2011; Martin, 2011).

4.5.1 Burkhan Tolgoi

Figure 4.20 Livestock remains in situ at Tomb 60B at Burkhan Tolgoi (Egiin Gol; image courtesy of Turbat, 2013).

In their 1996 close analysis of Burial 15 in the Burkhan Tolgoi cemetery at Egiin Gol, Éric Crubézy and his collaborators found that the different types of livestock excavated from the Xiongnu mortuary context – a horse, three cattle, and eight sheep or goats[30] – were treated differentially in the mortuary ritual that produced Burial 15. Crubézy et al. are particularly interested in the post-mortem treatment of the 2.5-year-old horse found as its skull and lower limb bones in Burial 15 in relation to later Central Asian mortuary practices involving various forms of horse sacrifice. Comparing the treatment of the horse to the cattle (bovines) and sheep/goats (caprines, rams), they concluded that "the way in which these animal remains were chosen and then arranged shows that not all of them had the same status: the quarters of meat (systematically first ribs or tongues) were hidden under the skins; those of the rams were at the

[30]"Caprines"

corners; the skulls of bovines (which are often absent from the texts) were represented here by mandibles, deposited among the other remains of fauna"[31] (1996: 105).

4.5.2 Gol Mod 1 and Burkhan Tolgoi

Hélène Martin's 2011 study compares faunal or zooarchaeological assemblages from both Gol Mod 1 and Burkhan Tolgoi, finding similar evidence for differential treatment of livestock or domesticated herd animals by species (or taxon) in Xiongnu mortuary practice. Martin interprets these distinctions in nonhuman animal remains as reflecting two distinct phenomena in Xiongnu mortuary practice: providing sustenance for the dead in opposition to symbolic accompaniment for the dead. Underlying this interpretation is a significant finding in Martin's analysis: variation in body-part distribution, taxon representation, and spatial organization of five muzzled beasts remains reflects cosmological and ideological diversity within a single Xiongnu cemetery (2011).

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[31] Original French: "[t]outefois, la façon dont ont été choisis, puis disposés, ces restes animaux démontre que tous n'avaient peut-être pas le même statut: les quartiers de viande (systématiquement des premières côtes ou des langues) étaient cachés sous les peaux; celles des béliers étaient aux angles; les crânes des bovinés (qui sont souvent absents des textes) étaient ici représentés pas des mandibles, déposées parmi les autres vestiges de faune" (1996: 105).

Figure 4.21 Horse crania and lower limb bones in situ in Tomb 20 at Gol Mod 1 (image courtesy of Martin, 2011).

4.5.3 Baga Gazryn Chuluu (BGC)

In 2011, Cheryl Makarewicz published her fine-grained zooarchaeological analyses of nonhuman animal remains from Xiongnu ring tombs in the Baga Gazryn Chuluu (BGC) archaeological landscape. Although Makarewicz conducted multiple zooarchaeological research projects on BGC Xiongnu assemblages (Makarewicz and Tuross, 2006; Makarewicz, 2011, 2015, nd), her 2011 book chapter presents the entire nonhuman animal assemblage for two Xiongnu ring tombs in osteobiographical detail. Although not the focus of that analysis, Makarewicz reconstructed what kinds of livestock, their minimum numbers of individuals, their ages at death, their estimated skeletal sexes, and body-part distribution. The two nonhuman animal assemblages from BGC comprised a similar overall number of domesticated herd animals, the variation between the two Xiongnu tombs was striking: number of herd animal species (taxon) present, age-at-death ranges for the largest taxon contingent in both (caprines, or sheep and/or goat), estimated skeletal sexes for caprines (sheep and/or goat), and body-part distribution all differed. Despite the small sample size, this pattern of variation in domesticated herd animal remains repeats in other zooarchaeological analyses of mortuary assemblages from Xiongnu ring tombs in the BGC archaeological landscape (Hite, n.d.a,b; Hite and Delgermaa, 2010; Johannessen and Hite, n.d.; Makarewicz, n.d.). The zooarchaeological evidence from BGC suggests a pattern of variation operating within set parameters, where living Xiongnu predominantly (but not exclusively: see Makarewicz, n.d., 2011) and consistently deposited domesticated herd animals in their tombs, but they varied the total number of minimum individual animals, total number of species (taxa), number of animals by species (taxon), ages, skeletal sexes, and body parts of these livestock from tomb to tomb. Other zooarchaeological analyses of livestock remains recovered from Xiongnu ring tombs located in the BGC archaeological landscape echo the inter-tomb variation in livestock taxon (or species), individual count, and body-part distribution observed by Makarewicz

Although relatively few Xiongnu tombs have had their nonhuman animal remains analyzed as a complete zooarchaeological assemblage, the above research provides highly valuable perspective on how the Xiongnu included livestock in their mortuary rituals and space. When specific osteobiographical information – minimum number of individuals (MNI: see Appendix D), species (or taxon), age-at-death, skeletal sex, and body-part distribution – is available for nonhuman animal assemblages from Xiongnu mortuary contexts, a pattern of inter-tomb variation in five muzzled beasts deposited emerges. These specifics of nonhuman animal bodies within Xiongnu burials indicate variability within the shared imperial mortuary culture of depositing livestock that is not yet well-understood. A productive approach to investigating the role of five muzzled beasts in Xiongnu ideologies as performed in mortuary ritual would be to revisit the archaeological practice of disarticulating a discrete, intentional context (i.e., a tomb or burial) and examine the variations in nonhuman animal bodies in relation to other materials within the mortuary assemblage.

A promising path of re-assemblage – of placing nonhuman animal remains back into relation with materials deliberately interred with them in mortuary space – arises from the character of mortuary space as containing the remains of at least one human being. By regularly and deliberately depositing livestock remains in their tombs, living Xiongnu regularly and deliberately interred humans and domesticated herd animals together. From this perspective, we might consider the ways in which living Xiongnu believed these people and five muzzled animals belonged together and acted along those logics. Xiongnu mortuary practice not only revolved around assembling nonhuman animal remains into the tomb, but around constructing relationships between specific people and five muzzled beasts in death.

4.6 Human-Animal Relationships and Xiongnu Mortuary Practice: Embodying Ideological Contestation and Imperial Transformation

Nonhuman animal bodies in Xiongnu mortuary contexts index ideological complexity otherwise potentially obscured through the ostentatious material culture of elite imperial mortuary practice. As discussed above, the specifics of domesticated herd animal bodies – taxa present, body-part representation, individual animal count, and spatial organization – at Gol Mod 1, Burkhan Tolgoi, and Baga Gazryn Chuluu suggest local and regional ritual practices and ideological projects not reducible to or subsumed by imperial-scale mortuary practice. It seems highly significant that Xiongnu communities realized ideological and social diversity with the bodies of the five muzzled beasts in association with humans in mortuary space, as domesticated herd animals and herders together comprised the living core of mobile pastoralism. Detailed examination of the associated human and nonhuman animal bodies in Xiongnu mortuary contexts at scales of individual burials, burials and their associated features, cemeteries, regional groupings of cemeteries, and cemeteries across the Xiongnu imperial sphere of influence may elucidate disparate yet intersecting ideologies and lived experiences that comprised the Xiongnu Empire.

The presence of domesticated herd animals fundamental to Inner Asian mobile pastoralism indicates the centrality of these animals in imperial Xiongnu mortuary practice. But the nonhuman animals in Xiongnu mortuary contexts are intentionally associated with humans, which strongly suggests the merit of analyzing human and nonhuman animal bodies together in order to examine the logics driving Xiongnu mortuary ritual and what they might suggest about Xiongnu social life and political dynamics. That the majority of the nonhuman animal remains belongs to members of the five muzzled beasts further suggests that the cosmological order and ideological commitments of the Xiongnu Empire enacted and contested through mortuary practice intertwined with the lived experiences, interspecies relationships, and political dynamics of a mobile pastoral way of life. While specific pastoral production practices, mobility strategies, and ideologies that explain the consistent association of domesticated herd animals with humans in mortuary contexts within the Xiongnu Empire remain unidentified, archaeologists have noted and argued for the critical interlinkages between mobile pastoralism, mortuary rituals, and the Xiongnu Empire for nearly a century (Dorjsüren, 1961; Batsaikhan, 2003; Törbat, 2004).

Recent empirical research on human-animal relationships during the Xiongnu Empire as seen in daily life and mortuary practice (Houle and Broderick, 2011; Makarewicz, 2011; Martin, 2011; Miller et al., 2018), the local articulations of pastoral lifeways and the work of empire (Honeychurch and Amartuvshin, 2007), and complex multiscalar political dynamics enacted through mortuary practice (Miller, 2014; Miller and Brosseder, 2017) shed new light on scholarly theorizations of imperial political organization and social life specific to mobile or nomadic pastoralism (Di Cosmo, 1994, 1999; Kradin, 2005; Barfield, 2011; but see Sneath, 2007). Recent consideration of the importance of animals in Xiongnu mortuary space and practice build significantly upon the longer thread of human-animal relationships as a recurrent theme in archaeological research (Dorjsüren, 1961; Batsaikhan, 2003; Makarewicz, 2011; Martin, 2011; Yang, 2011; Miller et al., 2018).

Based on work in Mongolia, proportions of five muzzled beasts taxa appear to vary by region and locality (Houle and Broderick, 2011; Honeychurch, 2015, but see Törbat, 2004); this variation may reflect nonhuman animal suitability to ecological conditions, local subsistence strategies, political organization of pastoral production, and/or social logics shaping animal husbandry practices. Recent scholarship posits that herder expertise and social networking constitute sophisticated mechanisms of adapting and maintaining pastoral production (Honeychurch, 2015; Wright and Makarewicz, 2016). Recognizing that political dynamics and social frameworks shape mobile pastoral political economies at local, regional, and state levels extends understandings of these societies beyond nomadism as ahistorical and apolitical adaptations to harsh environments. Research along these lines positions human-animal relationships and the movement enacted by those humans and their herds as central and universal to mobile pastoralism across time and space; moreover, their centrality shapes the social life, political imagination, and phenomenological sensibilities of mobile pastoralists (Honeychurch and Makarewicz, 2016). How human-animal relationships – and the movement they entail and enact – actually shaped given mobile pastoral societies, including the Xiongnu Empire, is an ongoing concern in archaeological research.

4.7 Conclusion: The Return of Mobile Pastoralism

The domesticated herd animals of Inner Asian mobile pastoralism in particular and nonhuman animals more generally recur throughout the previous historical and archaeological perspectives on the Xiongnu Empire. Their presence in our understanding of the Xiongnu is often subtle and yet constant. These domesticated herd animals – representatives of the five muzzled beasts – manifest the centrality of Inner Asian mobile pastoralism to the Xiongnu Empire that spans life and death. The consistent, intentional association of five muzzled beasts with humans in Xiongnu mortuary contexts embodies the centrality of those human-animal relationships within the empire. For the Xiongnu, it appears that the human-animal relationships that constituted the core of their mobile pastoral way of life encompassed subsistence practices, economic production, movement, place making, and ritual praxis. The continual discovery of human and domesticated herd animal remains intentionally assembled in Xiongnu tombs indicates that potent beliefs, values, and logics suffusing Xiongnu mortuary ritual were animated and informed by the human-animal or interspecies relationships at the core of mobile pastoral lifeways. One may infer from the archaeological evidence discussed in this and the previous chapter that human-animal or interspecies relationships were foundational to Xiongnu society across social, economic, and ideological spheres spanning life and death.

To better understand these dimensions of the Xiongnu Empire and its body-politic will require a closer look at mobile pastoralism and the lifeways that comprise it. The next chapter will present mobile pastoralism as an interspecies endeavor and elaborate on key dynamics and realities of that endeavor in the context of multispecies herding communities. This argument expands upon Honeychurch's vision of mobile pastoralism using multispecies ethnographies from Mongolia and surrounding regions, delving into the intimacies, specificities, and complexities of the human-animal relationships or interspecies entanglements of these ways of life. This ethnographic context overlaps geographically and species-wise with the Xiongnu herds of the Iron Age Mongolian Plateau, although no direct parallels between the present and deep past are drawn. As exemplified in modern mobile pastoral Mongolia, human herders and their domesticated herd animals – sheep, goat, cattle, and horse – engage in complex, life-long relationships of asymmetrical interdependence. The particularities of these dynamics that result from intersections of biology, sociality, affect, and history shed light on potential avenues by which to explore Xiongnu mobile pastoral lifeways and suggest the world-building power of close, long-term interspecies entanglements.

CHAPTER 5

MOBILE PASTORALISM AS MULTISPECIES ENDEAVOR

5.1 Introduction

Mobile pastoralism, or pastoral nomadism, is a political economy and way of life characterized by the interdependence of human herders and domesticated herd animals. Pastoralism denotes modes of subsistence and economic production where humans raise and rely on domesticated nonhuman animals, particularly herd animals. Mobility, or movement, combined with pastoralism expands the ecological contexts where pastoralists and their herds can dwell. Adding and/or increasing mobility in a pastoral economy will intensify the relationships between herders and herd animals because herders spend more time with their animals as they move throughout the days, seasons, and years. The interactions between herders and herd animals are thus a heightened variety of the world-building multispecies entanglements or human-animal relationships identified in multispecies ethnographies (see Chapter 6). This project draws on insights from multispecies ethnographies and archaeologies of mobile pastoral contexts to frame mobile pastoralism as a complex multispecies endeavor.

Given the diversity of mobile pastoral lifeways in time and space, it is necessary to place mobile pastoralism in a context. Elucidating how mobile pastoralism is a multispecies endeavor of herders and their herd animals requires empirical details that come from specific examples. Therefore, this chapter will focus on multispecies herding communities in what is now Mongolia as just such a context in which mobile pastoralism is made real. Such a focus has several advantages. First, mobile pastoralism in this part of the world produced a long, diverse empirical record analyzed from archaeological, historical, and ethnographic approaches to understanding social worlds. Second, the novel empirical data generated and analyzed in this project derive from an archaeological site in Central Mongolia (the Xiongnu cemetery at Elst Ar) to the east of the Xiongnu imperial heartland located in north-central Mongolia. Third, as discussed in Chapter 3, evidence supports a level of continuity in the species of domesticated herd animals kept by mobile pastoral communities and polities in what's now Mongolia over centuries if not millennia. Despite such continuity, mobile pastoral lifeways in Mongolia responded to and were always embedded in historical and political contexts; the idea of a timeless, unchanging mobile pastoralism certainly does not apply to the Mongolian setting. While administrative institutions, productive emphases, land-use strategies, changed along with political regimes and historical transformations, the following analysis of ethnographic accounts from multispecies herding communities in Mongolia will propose that certain practices, rhythms, and dynamics that shape these mobile pastoral lifeways endured over long periods of time.

The ethnographic perspectives on multispecies herding communities in present-day Mongolia reveal interactions between herders and their herd animals that make these ways of life work. Fleshing out accounts from these multispecies ethnographies with veterinary and biological information about the relevant herd animals – sheep, goats, cattle (cow, yak, and their various hybrids), and horses – will suggest broader points about mobile pastoral lifeways/mobile pastoralism rooted in the human-animal relationships (multispecies entanglements) at the core of these lifeways. I will argue three theses of mobile pastoralism that are extrapolated from herder-herd animal relationships as a subset of multispecies entanglements: 1) the qualities and capacities of domesticated herd animals are not under full human control, and greatly shape each mobile pastoral lifeway in context; 2) human-animal bodily interactions are the primary activities that constitute a mobile pastoral lifeway; and 3) care is the predominant human undertaking (way of interfacing with herd animals) in a mobile pastoral lifeway.

5.2 A Few Words on Pastoralism and Mobility

This project uses the term ‘mobile pastoralism’ rather than ‘nomadism’. Nomadism conjures unfortunate connotations and conceptual baggage. The term’s problems are well-summarized by anthropologists Caroline Humphrey and David Sneath in the introduction to their 1999 book, *The End of Nomadism? Society, State, and The Environment in Inner Asia*. Humphrey and Sneath argue that “[n]omadism is a category imagined by outsiders and it brings with it many suppositions about pastoral life, such as that it is free and egalitarian (see discussion in Dahl 1979: 279; Gellner 1988) or based on segmentary lineages (Asad 1979) or uses a wandering type of movement (Lattimore 1962: 141-144). Other well-known images are of fierce, warlike tribes given to predatory expansion (Sahlins 1961) or simple folk whose highest cultural achievement is a colorful rug. Another, and influential view, is that nomads have a low technological capacity and are necessarily dependent on the ‘outside’ sedentary world (Khazanov 1984)…We prefer the term mobile pastoralism to nomadism because it does not bring with it the suppositions such as those mentioned above” (1999: 1). This project follows Humphrey and Sneath’s lead in an attempt to avoid the stereotypes with which nomadism is laden, and instead deploys a term with more explanatory potential: mobile pastoralism. Moreover, using the term mobile pastoralism better serves the project’s aims for two primary reasons. Firstly, mobile pastoralism directly refers to the two key, interrelated aspects of the lifeways that this project analyzes: animal husbandry enacted through varying techniques of mobility at different temporal scales. Second, the conceptual baggage loaded onto nomadism is frequently at odds with empirical evidence about mobile pastoral lifeways, communities, and polities, and diverts analyses of these phenomena away from empirically-grounded inquiry and into lengthy debates over definitions.

Mobile pastoralism is practiced by "groups who are principally dependent on livestock, and for whom spatial mobility is regularly employed as a survival strategy" (Dyson-Hudson and Dyson-Hudson, 1980: 16), leaving room for tremendous diversity in other social and political-economic particulars of a given society (ibid). Mobile pastoralism is a particular form of animal husbandry structured around mobility and movement across landscapes and ecological zones, often found in marginal environments, of humans and nonhuman animals together. Mobile pastoralism, particularly when characterized as 'nomadism', has often been conceptualized as a utilitarian mode of production that aims to maximize animal-derived commodities adapted to extreme environments or ecological niches (Mace and Houston, 1989; Khazanov, 1994). Such characterizations invoke an inherent instability or precarity to mobile pastoralism as a way of life rooted in the supposed economic limitations of transhumant animal husbandry (Lees and Bates, 1974; Barfield, 1981; Kradin, 2002, 2014).

Within the much broader category of livestock rearing peoples, pastoral communities, families, and groups who move their habitation sites (or households) to different locations within a calendar year (often organized by season) as part of rearing their herds are considered mobile pastoralists. Pastoral mobility exists on a spectrum of practices, but the distinction between moving households to new locations and sending one or a few herders with herds on their daily or seasonal movements often separates mobile pastoral from transhumant lifeways. Although conceptualizations of mobile pastoralism focus on household or habitation site movement, the amount of time each day that mobile pastoralists spend with some or all of their herd animals is an important but overlooked quality of mobile pastoral lifeways. This is particularly true in the many mobile pastoral settings that lack fences or enclosures around grazing areas. Each day at least one herder must accompany some or all herds to, within, and from these pastures and rangelands for their protection from predators, theft, and losing their way.

Very little about mobile pastoralism (also called or pastoral nomadism or nomadic pastoralism) is universal to all communities, polities, and groups whose mode of subsistence or political economy falls into the category. As Dyson and Dyson assert, "among groups who are principally dependent on livestock, and for whom spatial mobility is regularly employed as a survival strategy, there is an enormous variability in herd management strategies, in social organization, in land tenure, degree of dependence on agricultural products, interactions with outside groups, differentiation of tasks by age and sex, etc." (1980: 16) found on every continent but Antarctica and across several millennia into the present. What is universal about mobile pastoralism should be obvious: human herders coexisting with at least one species of domesticated herd animal.

The most common domesticated herd animals are horse (*Equus caballus*), donkey (*E. asinus*), and their hybrids (mules); cattle, including cow (*Bos taurus*), yak (*B. grunniens*), zebu (*B. indicus*), and their various hybrids; camelids, including Bactrian camel (*Camelus bactrianus*), dromedary (*C. dromedarius*), dromedary-Bactrian camel hybrids, llama (*Lama glama*), and alpaca (*Vicugna pacos*); sheep (*Ovis aries*); goat (*Capra hircus*); and reindeer (*Rangifer tarandus*). These species come in subspecies, breeds, and hybrids, and have changed in biology and sociality thanks to living under the management and care of humans for millennia (see Marshall and Capriles, 2014, for an overview of the domestication and roles of these species in human societies from an archaeological perspective). The biological and social changes undergone by domesticated herd animals have hugely impacted their relationships to human beings.

Herders and pastoralists raise herd animals for the qualities and capacities of their bodies, or what zooarchaeologists call primary and secondary pastoral products (Sherratt, 1981; Greenfield, 2010). Primary pastoral products include: meat, organs, sinew (tendons and ligaments), skin (leather, hide), horns, antler, hooves, and bones; primary pastoral products generally require a herd animal to be killed, in contrast to secondary pastoral products. Secondary pastoral products include: milk, fiber (wool, hair), dung, traction (pulling carts, wagons, chariots, ploughs, mill wheels, etc.), riding, and other forms of transportation (i.e., camel caravans transporting goods on their backs across deserts). A subsequent section will discuss how pastoral products actually come to be. Many of the capacities and qualities of domesticated herd animals that can become pastoral products result from or were greatly influenced by long-term, close relationships with humans. For example, wool is truly a product of pastoralism; what we know as wool – the continuous-growth fine fiber of modern sheep breeds – appeared millennia after sheep were first domesticated (perhaps well after: Jackson et al., 2020)[32]. Most modern and improved breeds of wool sheep must be shorn, or their wool will grow bulky and dense to the detriment of the animal's health. In a way, wool creates a form of interdependence between wool sheep and their shepherds: one needs to be rid of wool, and the other wants that wool. The many uses to which pastoralists can put their herd animals combined with the myriad species and breeds of domesticated herd animals generate a tremendous amount

[32]Modern (i.e., woolly) sheep have been known to 'revert' to archaic or wild phenotypes of non-wool coat production in certain circumstances, notably when a sheep escapes from a domesticated habitat to a 'feral' environment (Jackson et al., 2020). This phenomenon underscores the plasticity and responsiveness of living bodies.

of the diversity inherent to mobile pastoralism as a descriptive term for political economy or way of life.

Although Dyson and Dyson are correct to point out the great diversity comprised within mobile pastoralism, the archaeologist William Honeychurch counters that "[w]hile there is indeed great cross-cultural diversity, in my opinion the process of interweaving animals and movement into human communities is both relative and variable but is also entirely relevant. The everyday experience of living with animals and movement produces important commonalities as well as diverse expressions of pastoral nomadism" (2015: 55). Honeychurch's centering of "[t]he everyday experience of living with animals" together with mobile practices expands the analytical potential of mobile pastoralism by integrating economic, ecological, ideological, affective, and social spheres into an overarching way of life. While not denying the roles of specialized and subsistence economies or ecological adaptations, this characterization of mobile pastoralism brings the living beings who enact mobile pastoral lifeways (in imbricated, unequal relationships) over days, seasons, and lifetimes into the foreground. Where mobile pastoralism has often been understood as an economic mode of production (subsistence) and/or a specialized adaptation to marginal environmental niches (see Dyson-Hudson and Dyson-Hudson, 1989; and Honeychurch and Makarewicz, 2016, for overviews of these schools of thought), viewing mobile pastoral lifeways as the interdependent work, lives, and deaths of humans and domesticated herd animals promises to expand our understanding of these lifeways.

Arguing in the same vein as above, William Honeychurch expands on the insight that mobile pastoralism is fundamentally about sustaining humans together with nonhuman herd animals in his 2015 monograph, *Inner Asia and the Spatial Politics of Empire*. As discussed in Chapter 1, Honeychurch configures mobile pastoralism as a "lifeway" (2015: 57) rather than a societal or economic type. What Honeychurch argues to be fundamental to mobile pastoralism is shared, transmitted herder knowledge of and about the successful maintenance and propagation of herder-herd animal relationships embedded within broader social networks of families, communities, and polities. Following Honeychurch, this project positions the relationships between herders and herd animals as central to mobile pastoralism as a way of life and therefore to understanding it as an object of analysis. Herder-herd animal relationships span economic, ideological, and affective realms of experience, as illustrated below in accounts from mobile pastoral Mongolia. This orientation opens analytical space to propose features and dynamics of mobile pastoralism that resonate with the Mongolian ethnographic data, and explain overlooked or undertheorized dimensions of this way of life. It moreover articulates mobile pastoralism is a complex multispecies endeavor.

Mobile pastoralism is fundamentally a way of life built on the interdependence of herders and their herd animals. As we will see exemplified in ethnographic accounts from herding communities in modern Mongolia in subsequent sections, herd animals nourish and sustain their herders, and herders feed and care for their herd animals. This interdependence is mutual but asymmetrical. Although the asymmetrical relationship between herders and herd animals tilts in humanity's favor, human desires and intentionality do not solely dictate life within a mobile pastoral context. The ethnographic examples from multispecies herding communities and multispecies households (see Oehler and Varfolomeeva, 2019: i) in Mongolia illustrate particular instantiations of mobile pastoral lifeways. Despite the specificity of these ethnographic contexts, certain broader or quasi-universal dynamics shared across mobile pastoral lifeways can be extrapolated from the Mongol and Buryat cases.

5.3 Multispecies Herding Communities of Present-Day Mongolia (and Buryatia)

The relationships between human herders and their domesticated herd animals constitute the core of this lifeway in each context where it is found. To contextualize these overarching claims about mobile pastoralism, the project moves to ethnographic accounts of multispecies herding communities in Mongolia to argue that mobile pastoralism is a multispecies endeavor. The context of these multispecies ethnographic accounts is the nation-state of Mongolia located in Inner Asia, a place that anthropologists Caroline Humphrey and David Sneath describe as a long-standing cultural-economic zone spanning Mongolia along with parts of Russia, and parts of China (1999). "The Inner Asian steppe rolls away to the horizon," Humphrey and Sneath write, "herding here means personal presence with the livestock on the pastures, and it is generally unaided by fences or sheepdogs[33]. The climate is extreme, and in a day can range from burning sun to freezing sleet. The economic culture of Inner Asia is based on a complex type of pastoralism which employs several species of herbivorous livestock and requires movement between specific seasonal pastures" (ibid: 2).

This Inner Asian steppe is the broader setting where two ethnographic accounts of Mongolian mobile pastoral lifeways that flesh out this chapter's argument that mobile pastoralism is a multispecies endeavor.

[33]In mobile pastoral Mongolia of the 20th and 21st centuries, guardian livestock dogs (GLD) are the most common working dogs in multispecies herding households. The Mongolian heritage GLD breed, the *Mongol Bankhar* (монгол банхар), resembles the Tibetan mastiff and acts as a ferocious protector of the entire household. For more on dogs in Mongolia, see Linden (2022).

Figure 5.1 Mongolia and the overlap between Inner Asia and the Eurasian steppe zone (image courtesy of Honeychurch, 2015).

The first ethnography is Natasha Fijn's *Living with Herds: Human-Animal Coexistence in Mongolia* (2011: hereafter *Living with Herds*), which explores co-domestic relationships and spheres of multispecies herding communities in northern Central Mongolia (the *khangai* region). The second is Charlotte Marchina's 2015 doctoral thesis, *Faire communauté: Étude anthropologique des relations entre les éleveurs et leurs animaux chez les peuples mongols (d'après l'exemple des Halh de Mongolie et des Bouriates d'Aga, Russie)* [*Making Community: An anthropological study of relations between herders and their animals among the Mongolian peoples (from the example of the Khalkha of Mongolia and the Buryats of Aga, Russia*][34]. Hereafter *Making Community*, Marchina's thesis examines multispecies entanglements through the bodily interactions and spatial practices that constitute herding communities at multiple field sites in Mongolia and Buryatia (Russia).

Unsurprisingly, the details and complex dynamics of those human-animal relationships comprise the heart of Fijn's and Marchina's respective multispecies ethnographies. Fijn and

[34]Unless otherwise noted, all translations of Marchina's *Making Community* from the original French into English are my own.

Marchina each dwelt and worked with several multispecies households who raised some combination of sheep, goat, cattle (cow, yak, and their various hybrids), and Bactrian camel herds over the course of several years. Both observed, researched, and participated in daily and seasonal activities and events that marked these mobile pastoral communities: farrowing (livestock birthing), milking, herding on foot or horseback, shearing, castration, slaughter, veterinary care, and more. The two ethnographers thus provide rich, insightful analyses of the diversity of mobile pastoral practices within Mongolia today.

Both Fijn and Marchina analyze temporal rhythms and spatial practices that constitute and shape the multispecies herding communities of their research foci. One may anticipate that mobility plays a central role in all forms of mobile pastoralism, including among Mongolian herders. But Marchina indicates that Mongolian herders are first and foremost herders. "[Mongolian] herders do not use the term 'nomad' (*nüüdelchin*[35]) to speak about themselves ... Even today, the Mongols and Buryats who practice nomadic pastoralism are above all herders (mn. *malchin*; for sheep, br. *honinshin*; for horses, br. *aduushin*)[36]" (2015: 28).

Marchina's characterization of herder subjectivity in Mongolia and Buryatia – Mongolian peoples in two different nation-states – is fundamentally animal-oriented. Rather than 'Mongolian nomads', there are Mongolian herders (*malchid*, plural of *malchin* or "herder") who raise, care for, manage, and live off of their herd animals. A Mongolian herder may take on

[35] *Nüüdelchin* (нүүдэлчин) meaning 'nomad' in Mongolian, related to *nüüdel* (нүүдэл: "movement, move, moving": Bawden, 1997; "migration, movement from place to place": Bolor Toli online dictionary: http://bolor-toli.com/)

[36] Marchina's original reads "(mn. *malcin*; des moutons, br. *honinsin*; de chevaux, *aduusin*)". 'Mn.' denotes Mongolian; 'br.' denotes Buryat. The Mongolian terms using this project's transcription system are: *malchin*/малчин ("herder"); *khon'chin*/хоньчин ("shepherd", lit. sheep herder); and *aduuchin*/адуучин ("horse herder").

more specific roles if they focus on a particular species. For example, a herder who specializes in horses is an *aduuchin* (see Footnote #38).

Movement, migration, and other spatial practices are vital to Mongolian mobile pastoral ways of life. Spatial practices of Mongolian and Inner Asian mobile pastoral communities and polities have received significant attention from archaeologists (Honeychurch and Amartuvshin, 2006; Frachetti, 2008, 2011; Rogers, 2012, 2013; Honeychurch, 2014, 2015; Honeychurch and Makarewciz, 2016), historians (Humphrey and Sneath, 1999; Bold, 2001; Allsen, 2006; Sneath, 2007; Atwood, 2015a; Biran, 2019), ethnographers (Marchina, 2019; Eriksen, 2020), and geographers (Simukov et al. 2007a, 2007b, 2008; Ahearn, 2018). These works represent significant contributions to scholarly understanding of mobile pastoralism across millennia of political regimes and ecological zones through the analytic of mobility. In this project I take a slightly different tack and approach the spatial techniques and practices of Mongolian mobile pastoralists from the perspective of human-animal relationships. Mobility in this context is a suite of techniques and practices for serving the herd animals and herders who constitute the mobile pastoral communities of Mongolia. This perspective is informed by Marchina's attention the temporal rhythms of mobility in these multispecies herding households and communities, where "[t]he seasonal mobility of humans and animals is nonetheless an essential component of the pastoralism of the Mongolian peoples. This mobility is a means of maintaining the balance between the resources and the pressure exerted on them by herders and their animals ... However, we will see that the mobility of Mongolian and Buryat herders is not only dictated by environmental conditions, but also determined by social, political and comfort factors, human and animal" (2015: 28).

Figure 5.2 A girl on horseback drives a herd of cattle home for evening milking near Ulaan Chuluut, Arkhangai *aimag* (image courtesy of of Munkhbold Zaankhuu).

Marchina reinforces the idea that mobility serves the needs of herd animals, again placing the animal or pastoral as a priority for herding communities in Mongolia through practice in addition to self-conception. As Marchina notes, Mongolian herders deploy these techniques of mobility for a variety of reasons, but the 'pastoral' component of 'mobile pastoralism' comes first. These points support the perspective on mobile pastoralism as fundamentally constituted by human-animal relationships (or herder-herd animal relationships). Herd animals are central to the mobile pastoral lifeway and the people who live it. Mobility is a spatial technique for meeting the collective needs of these multispecies households. In mobile pastoral Mongolia today, "[h]ouseholds practice annual cycles of mobility, bringing people back to the same regions for their seasonal camps as well as daily cycles of mobility, when livestock are brought out on forage and return home in the evening" (Ahearn, 2018: 2). Scholarship on mobile pastoralism devotes significant attention to the seasonal logics of mobility, but, in rural Mongolia at least, the daily logics also play constitutive roles in the multispecies herding households and communities of Mongolia. This raises the important issue of the ways that temporal rhythms organize and characterize mobile pastoral contexts.

5.3.1 Daily, seasonal, annual: temporal rhythms of multispecies herding communities of Mongolia

In *Living with Herds*, Fijn encapsulates the intertwined lives of herders and herd animals in Central Mongolia through temporal logics of lifetimes, seasons, and days when she argues that "[l]ife as a herder is structured around and mapped onto the lives of the herd animals" (2011: 242). In her observation, "[t]he herding family wakes when the cows are ready to be milked and retires to bed only when the sheep and goats have been herded safely into the pens and corrals for the night. A herder's daily tasks coincide with the gender and age of the animals: Young children are encouraged to herd the young animals near the encampment; strong, young men handle the heavier male geldings and oxen; women nurture young and milk the female animals. When the seasons change and the herd animals begin to search for new pastures, herding families take their cue and move on to the next seasonal encampment" (2011: 242).

Specific activities, like milking and herding to and from daily pastures, are joint endeavors of herders and herd animals undertaken on a daily basis. Note that within these multispecies households activities are organized along lines of species, gender, and age. The above passage also highlights key temporal dynamics that structure the lives of Mongolian herders and herd animals. Daily activities vary with season but are fundamentally interactions between people and their sheep, goats, cattle, and/or horses. Someone in the household must herd sheep and goat to and from pastures each day. Someone must catch, tie, and milk the mother cattle during milking season. The daily nature of these tasks – these required interactions between herders and herd animals – is more pronounced than it may appear. Herders may follow general daily schedules, such as milking in the morning, but must be on call for their herd animals all-day, every day.

In *Mongolian Nomadic Society*, the historian Bat-Ochiryn Bold argues that "[t]he image of a shepherd sitting near his grazing sheep, chatting the day away or snoozing, does in fact represent nomadic livestock keeping work, and such images are characteristic. The search for lost or stolen animals (mostly horses or camels) takes a long time and the livestock keeper can be gone for weeks on end. As the SHM[37] shows, this was also true in early times (SHM, 90). Bringing animals to the market (Mong. *mal tuukh*[38]) has been a form of work for centuries in Mongolian livestock keeping. All this is livestock keeping activity and has economic significance. Labour relating to production in Mongolian livestock keeping can be categorised according to day and season. The daily work programme of nomadic livestock keeping – keeping watch, watering, driving, milking, etc. – requires, in comparison with agriculture, little physical exertion. But livestock keeping has no seasonally dependent suspension of the work programme as occurs in agriculture. If one considers the amount of exertion required by Mongolian nomads, then one finds many situations that require physical work, for example putting cows out to pasture, putting calves to pasture separately from their dams, putting small animals to pasture, checking on large animals and driving them into stalls, etc. Seasonal labour consists of shearing wool, cutting hair, tending young animals, making dairy produce, breaking in horses, gathering hay, building stalls, migrating to the summer, autumn, winter, spring sites,

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[37]SHM = *Secret History of the Mongols* (Монголын Нууц Товчоо/*Mongolyn Nuuts Tovchoo* in Mongolian).
[38]*Mal tuukh* (мал туух) meaning "to drive livestock" (Bawden, 1997). See Chapter 8.2.6, Glossary, and Appendix J.

etc." (2001: 61-63). Bold counters the stereotype of mobile pastoralism as a low-effort livelihood by pointing out that herders engage in significant amounts of labor. Although the amount of labor expended varies by season and the specific practice within the mobile pastoral lifeway, herders do not manage their herds by "chatting the day away or snoozing".

Bold lays out the extent and variety of labor involved in pastoral production to challenge the assumption that mobile pastoralism is an economically limited and primitive political economy. The activities Bold recounts all require time, bodily engagement, and skill. Moreover, there are key dimensions of labor in mobile pastoralism that Bold raises or implies. Where Bold identifies the lack of a seasonal suspension of mobile pastoral labor, one may extrapolate the constant temporal demands on herders: a herder's life is spent 'on-call'. Herders must answer demands, needs, or crises of their animals whenever they arise. In addition to these constant, direct demands on a herder's time, mobile pastoral lifeways in Mongolia (and elsewhere) require herders to undertake a significant amount of labor. The clearest examples of this labor involve pastoral products.

5.3.2 Grown, made, birthed, killed: herders' labor and pastoral products

When viewed as an economic mode of production, mobile pastoralism consists of the production of primary and secondary pastoral products. As discussed in a previous section, these products derive from the biological and social qualities and capacities of herd animals. Meat, milk, dung, traction, and so forth come from or through herd animal bodies. At first blush, pastoral products may appear to be natural objects. Herd animal bodies are biological entities. As we shall see Fijn argue in a subsequent section, herd animals are not the products or creations of pastoralists. Rather, herders foster the social and practical environment that permits herd animals to develop and grow along ontogenetic trajectories influenced but not controlled by humans (2011: 103). Herd animal bodies as consumed and put to use involve minimal human labor. But even the most 'unprocessed' animal products take shape as products due to human labor and a constellation of interactions, events, and practices over generations if not millennia.

Meat – the ultimate pastoral product – serves as an excellent example. What does it take to "make" meat? For the five muzzled beasts, meat is a transformation of an animal that successfully grew to a certain age and body size into muscle, vessels, organs, and other organic matter that humans wish to consume. That living animal's individual success rests on the animal taking in sufficient nutritional and caloric input from conception throughout life, with variations according to each phase of the animal's development. Such individual success requires a life safe or at least saved from starvation, thirst, disease, injury, (unwanted) predation, and extreme conditions (flood, drought, *zud*[39], etc.). That success includes the life of the animal's while it was in utero (and generally required to survive infancy), which rests on a lineage of herd animal success stories over human and herd animal generations.

The chain of successes appears natural. Wild animals, including the wild relatives of the five muzzled beasts, reproduce, develop, and growth without human intervention. But in a mobile pastoral lifeway or pastoral economy, human intervention and labor directs, shapes, and even initiates the chain of successes. Add to this the more direct forms of labor that it takes to 'make' meat: slaughter, butchery, and meat preservation. Herders select a sheep, goat, cow, or horse from the herd; they must catch and secure it by hand or rope, and restrain it. Slaughter

[39] *Zud* (зуд, sometimes *dzud*) is the Mongolian umbrella term for "disaster affecting livestock caused by severe natural conditions" (Bawden, 1997). *Zud* are seasonal catastrophes where ecological and meteorological factors kill off five muzzled beasts, generally due to starvation in winter or spring. See Appendix B.

methods vary in mobile pastoral Mongolia. Sheep and goat are often laid out on the ground on their backs, with one person kneeling at the head and holding the forelimbs, and a second person securing the hindlegs and wielding a knife. Making an incision in the thorax, the second person reaches a hand into the chest cavity and pinches off the sheep's or goat's aorta. Death is quick and relatively bloodless. The larger animals, or *bod mal*, may be dispatched with a cudgel between the eyes, or a knife between the base of the skull and the spinal column.
Then herders proceed through the skilled physical work of skinning, breaking limbs at the joints, pulling innards from the abdominal cavity without spilling blood or partially-digested food, and butchering the carcass for the cuts and portions they wish. Meat, that most 'natural' of pastoral products, is thus both grown and made.

Much of the fundamental work and care that herders pour into the production of meat applies to all other primary and secondary pastoral products: animal fiber, dairy products, leather and hides, riding, cart-pulling, and so forth. In his discussion of labor in a mobile pastoral political economy, Bold (2001) strategically skims over such nitty-gritty details of pastoral production in order to paint a general picture of herding life in Mongolia suited to the ways his book traces mobile pastoral practices and institutions from the Mongol Empire to the post-socialist or democratic period of the 1990s. Bold thus implies that important rhythms and constraints within Mongolian mobile pastoral lifeways are little impacted by larger political and historical changes. However, as anthropologists Humphrey and Sneath (1999) convincingly argued in *The End of Nomadism?*, mobile pastoralism in Mongolia is a variable, flexible political economy that underwent numerous documented historical changes (see Chapter 1) as it intersected with political transformations. The level at which Bold's implication holds true is that sheep, goat, cattle, and horses need food and water every day, whether a new king has been crowned or whether the planned economy has collapsed.

The daily work of “keeping watch, watering, driving,” and grazing safely in pastures is the bare minimum of a herder’s prerogative to keep their herd animals.

Figure 5.3 A horse herder (*aduuchin*) drives a herd of horses up from morning watering in the Orkhon River through the Xiongnu cemetery at Baruun Mukhdagiin Am, Mogod *sum*, Bulgan *aimag* (image courtesy of Galdan Ganbaatar).

Herders’ work is on-call and constant, and consistently goes beyond this ‘bare minimum’ in order to keep herd animals alive, well, and nourished. *Living with Herds* and *Making Community* recount much of this broader range of a herder’s prerogative, including: harvesting fodder and feed for winter; bottle-feeding young orphaned herd animals; administering necessary minerals like salt; protecting their animals from predators, disasters, and accidents; providing veterinary care in cases of injury, illness, and complications to pregnancy, birthing, and the vulnerable first days of a young animal’s life. Whether specified in each Mongolian case or not, these are responsibilities, activities, and undertakings that any mobile pastoral lifeway requires of herders.

What is required from herders in the form of their labor arises from the needs of their herd animals. Herd animals' needs are bound up in their biologies and their social lives. Moreover, the biological qualities and capacities of herd animals – in the Mongolian cases explored here, sheep, goats, cattle (cow, yak, and their various hybrids), and horses – make mobile pastoralism possible. Those herd animal qualities and capacities are inextricably bound up in season, a temporal logic that directly impacts the bodies and behaviors of herd animals. As a result, seasonality greatly dictates the activities, events, and interactions of herders and herd animals in mobile pastoral lifeways, particularly among the multispecies herding communities of Mongolia.

5.3.3 To everything there is a season

Herders manage and care for their herd animals on daily, seasonal, and annual rhythms. What a herding community's day involves depends greatly on the season. Yet each season is made up of different daily tasks, events, and interactions for a herding community. Moreover, years are marked by a complete turn of the seasons, what Richard Tapper terms the pastoral year in his 1979 monograph, *Pasture and Politics: Economics, Conflict, and Ritual among the Shahsevan Nomads of Northwestern Iran*. Tapper argues that the pastoral year is one dimension of time and space marked and thus organized by public ritual activity amongst the mobile pastoral Shahsevan (1979: 154). His insight contextualizes the following discussion of socio-biotic events and processes in domesticated herd animals as inherently shaping and bound-up in broader practices and relations of human sociality, a reality which will appear in the Mongolian ethnographies of multispecies herding communities.

Daily, seasonal, and annual temporal rhythms intersect and intertwine, and manifest in the bodies and lives of herd animals, joining other temporalities that constitute biotic life. Temporality is inextricable from life and its biological processes. Living bodies exist, grow, change, and decay along numerous temporalities: circadian rhythms, ontogenetic development, cell cycle, tissue regeneration, and so forth. The season stands out as a constitutive temporal logic working on herd animal bodies and shaping the multispecies activities, practices, and events of mobile pastoral communities as discussed in Fijn's and Marchina's multispecies ethnographies of Mongolia. Season, or time of year, is a recurring temporality to which many people today living in urban, climate-controlled environments of grocery stores and office buildings pay little mind. For mobile pastoral communities, season sets the conditions of life. This is marked in the material bodies of domesticated herd animals.

In what is now Mongolia, sheep, goats, cattle, and horses graze on grass and leaves that finally grow green under the Mongolian summer sun. The herds fatten on this vegetal life into autumn, until subzero temperatures and snow blight the landscape, starving livestock as winter deepens. Spring follows, bringing new trials for herds and herders: weather is extreme and variable, with rain, dust storms, hail, sunshine, and snow often occurring in a single spring day. In late winter or early spring, the literal life-and-death labor of livestock birthing seasons – lambing, kidding, calving, and foaling – starts. Labor and birth often occur in the midst of the worst weather and fodder conditions, making spring the most stressful and exhausting of the four seasons. Then another summer follows; the lambs, kids, calves, and foals nibble their first blades of grass under another summer sun.

Seasonality is a cyclical temporal logic but not a static one for herd animals and their herders. How each season impacts herd animals and their bodies will have material consequences for the entire multispecies household. If the herds do not fatten on summer grass and autumn growth, they are more likely to perish in the freezing winter. Flocks of sheep and goats do not increase in size, let alone replace those individual animals slaughtered for food or felled by predators and disease in the previous year, unless lambs and kids survive their spring-time births and the early weeks of vulnerable infancy. Female herd animals produce no milk unless they are nursing their offspring. No milk means no dairy products. Milk fills the udders of nursing mother herd animals in order to feed their young; milk rests on the successful delivery and survival of those young. Newborn livestock result from a successful pregnancy, usually spanning the unforgiving months of winter, that places new and heightened nutritional demands on the female herd animals. Pregnancies rest on the successful growth and development of female animals and at least one intact male to the age of sexual maturity in their species (or a compatible near-species). Season may cycle to season inexorably, but for individual herd animals to survive and for herds to thrive from one season to the next, herders must constantly intervene. Successful growth and development of herd animals requires sufficient food and care from herders and mother animals from birth. This spring's calves are born to cows who themselves were calves born two springs past, now well-grown enough to have fallen pregnant last season. The cycle of life begins again.

These temporal rhythms work on herders as well as herd animals. The lambs born this spring will become breeding ewes in the next autumn. The little boy who chases the sheep and goat on foot out to pasture will in ten years become the youth who selects, breaks, and trains his own riding horse. *Living with Herds* succinctly describes the entanglement of season, the needs of herders and herd animals, and the behaviors and practices of these multispecies households in modern Mongolia, where, as Fijn writes, "the four seasons are pronounced. With each season the family moves to different pastures for the benefit of the herd animals. The herd animals' routine changes after each move, so therefore the work the herders engage in also changes" (2011: 199).

But why does that work change? Ultimately the work of herders responds to the needs of their herd animals and what they need from their herd animals. Those in turn are rooted in the social and biological capacities and qualities of herd animals: sheep, goats, cattle, and horses in mobile pastoral Mongolia. A herd animal's bodily state – physiology, behavior, stage of development – is inextricably wrapped up in both the time of year (season) and time of life (calendrical age). Thus, seasonal logics of mobile pastoral lifeways in Mongolia fundamentally operate on and through the bodies of herd animals. In the same section of *Living with Herds* as the passage above, Fijn specifies key seasonal activities and events within the broader array of mobile pastoral life in the multispecies herding communities of Mongolia. "Every herder knows that spring is the time for haircutting and combing, assisting animals in birth, and nurturing young; summer is the time for milking, making hay, socialising, and attending Naadam festivals; autumn is the time for castrating horses, gathering medicinal herbs, and culling the herds for the winter ahead; winter is the time of rest and retiring into the warmth, preserving energy, and celebrating the coming year with the White Month (*Tsagaan Sar*) celebrations" (Fijn, 2011: 199).

Note how often bodily qualities and capacities of herd animals figure in these seasonal activities and events: combing cashmere goats alongside helping with lambing, kidding, calving, and foaling in winter; milking female animals who are nursing their young in summer; castration and slaughter in autumn. These activities and events rely on and respond to social and biological capacities and qualities of domesticated herd animals. To understand the significance of this dynamic requires a closer examination of herd animal capacities and qualities that enable mobile pastoral lifeways.

5.3.4 Capacities and qualities of herd animals

Fijn extrapolates from her fieldwork among multispecies herding households and communities in Central Mongolia to a broader reality of pastoral production: the livestock that form the bedrock of the political economy grow and develop on biological pathways beyond perfect human control. Those biological pathways generate capacities and qualities in domesticated herd animals at the levels of individual and species. Certain capacities and qualities of domesticated herd animals make mobile pastoralism possible as a way of life and a political economy. As Fijn notes, "herders do not make livestock; they assist in providing the right conditions to allow the animals to grow. Animals are not made, as a cart or dairy products are made; they have their own development that is beyond human control" (2011: 103).

In the example of multispecies herding communities of Mongolia, distinct and sometimes overlapping capacities and qualities characterize sheep, goats, cattle (cow, yak, and their various hybrids), and horses. As mammals, the females of all four species produce milk to feed their newborn and young offspring. All four species are killed, butchered, and eaten. Horses can be trained for riding and, less commonly, for cart pulling. In reverse, cattle can be trained for cart pulling and, less commonly, riding. Sheep produce wool. Cashmere goats and yak produce hair follicles that can be harvested by combing and produced into textiles (Erdenetsogt, 2014). These four types of Mongolian herd animals produce milk, grow hair and/or wool, and of course have physical bodies made of flesh, bone, organs, and other tissues that herders can eat or put to a variety of uses, alive or dead.

However, in making use of their herd animals, herders must always work around or with social and biological qualities of the animals that they herd as both enabling and constraining.

While biological and social capacities and qualities make these primary and secondary pastoral products possible, those transformations always require human intervention (labor; intention and care); this point will receive greater attention in a subsequent section. Domesticated herd animals in (mobile) pastoral contexts thus exemplify the qualities of nonhuman animals that supersede human intention. While social and other biological qualities of herd animals impact mobile pastoral lifeways through their social structure, behavior, nutritional requirements, and so forth, those qualities anchored in reproductive biology shape, constrain, and enable those lifeways in fundamental ways.

The best examples of such qualities to which humans must simply accept and adapt in order to lead a mobile pastoral way of life are key immutable biological qualities of herd animals rooted in their reproductive biology. The propagation of individual animals is bound up in the propagation of flocks and herds together with herders' abilities to generate primary and secondary pastoral products. Reproductive biology as it pertains to mobile pastoral propagation encompasses breeding (conception, impregnation), gestation (pregnancy), parturition (birthing), and lactation (producing milk) in sheep, goats, cattle, and horses. Breeding, gestation, parturition, and lactation are events and processes that occur within major biological constraints, along (mostly) immutable biological trajectories, and imbricate with herd animal sociality (especially vis-à-vis humans). In other words, pastoralists can manage and influence these fundamental aspects of their herd animals' bodies and lives, but do not fully control them. Herd animal reproductive biology greatly shapes but does not ultimately determine the contours of mobile pastoral lifeways. Specific aspects of the four components of herd animal reproductive biology relevant to mobile pastoral propagation reveal how that shaping works.

5.3.4.1 Breeding

Breeding is a primary human intervention into the lives of domesticated animals. It is a core component of animal domestication as an ongoing relationship (Russell, 2002; Marchina, 2015). The managed reproduction of domesticated herd animals in mobile pastoral lifeways exemplifies how material, bodily interactions are jointly biological and social. This management involves maintaining genealogies of herds and individual animals of each species raised. Herders and pastoralists select sires and dams (fathers and mothers) for desired social and biological qualities, and what qualities are desired will vary with each context. This herder may breed for docile sheep, while another may prioritize sturdy frames and muscled bodies. Herders manage the breeding of their herd animals, but of necessity work with biological constraints. Within biological constraints, the seasonal limitations on sheep, goats, and horses exemplify this millennia-old negotiation.

Domesticated sheep, goats, and horses are seasonally polyestrous (Merck, n.d.), meaning that ewes, nannies/dams, and mares are receptive and fertile multiple times within a limited period of time during each calendrical year. In other words, sheep, goats, and horses are most likely to fall pregnant within specific seasons, and very unlikely to conceive outside of those seasons. Sheep and goats experience estrus (receptivity that can lead to impregnation) as a function of the amount of sunlight per day. Outside of tropical and equatorial climates (and with some variation by breed, especially in modern improved breeds), ewes and nannies/dams experience estrus and fall pregnant between August and February[40].

[40]For more information about sheep reproduction, consult the following online resources:
http://omafra.gov.on.ca/english/livestock/sheep/facts/12-037.htm
https://extension.oregonstate.edu/animals-livestock/sheep-goats/understanding-sheep-reproduction-helps-ranch-productivity

Domesticated horses display similar constraints due to their seasonal polyestrous reproductive biology. Unlike sheep and goat, who experience receptivity during periods of shorter daylight, horses enter estrus during periods of longer daylight, rendering them "long-day breeders" (Merck, n.d.). Mares in the northern hemisphere experience vernal transition marked by variable ovulation (a period of approximately two months from mid-February to mid-May) until they achieve their true ovulation period (mid-April through mid-September), ceased by a second transition of variable ovulation until reproductive quiescence November through February. Thus, until the 20th century, pastoralists had to breed their sheep, goats, and horses within the species-specific time periods of each calendar year. Seasonal logics set the terms of the herder's calendar through herd animal ovulation as a function of sunlight.

In contrast to sheep, goat, and horses, domesticated cattle are polyestrous without seasonal constraints and can be bred at any time of the calendar year. Cattle can fall pregnant during any season throughout the calendar year. Thus, human herders have much more say in determining breeding seasons for their cattle compared to their sheep, goats, and horses. As a result, calving season is much more up to herders than lambing, kidding, and foaling seasons. The different reproductive biologies of these four species create practical differences in how herders breed and manage them. Before culturally-specific economic and political choices about breeding and seasonal animal husbandry practices may be considered, the reproductive biology of domesticated cattle, sheep, goats, and horses places different constraints on breeding. As mentioned above, a herder is very unlikely to successfully breed her ewes in June, no matter how much she might wish to do so. A herding community cannot leave their breeding bull in with the cows unless they want unmanaged, unsupervised breeding (and thus birthing) all year round.

Hybridization, or breeding across species lines, also exemplifies a negotiation of biology and culture. Many pastoralists breed horses to donkeys in order to produce the hearty (and famously stubborn) mule. Interbreeding of domesticated camelids in the Middle East and Central Asia has produced Bactrian camel-dromedary hybrids for centuries (Dioli, 2020). In Mongolia, cattle hybrids are a common component of multispecies herds in certain regions, including those where Fijn and Marchina conducted their ethnographies. Cows (*Bos taurus*) and yaks (*Bos grunniens*) can produce viable offspring called *khainag*, of which the females are fertile while the males are infertile. Female *khainag* bred to cow bulls produce can successfully breed with cow and yak bulls. Second generation cattle hybrids are generically known as *ortoom*. *Naran ortoom* are female *ortoom* born of a female *khainag* dam and a cow bull sire; *usan ortoom* are female *ortoom* born of a female *khainag* dam and a yak bull sire. The male *ortoom* with a cow bull sire is a *khainagiin shar*; the male *ortoom* with a yak bull sire is an *usan güzee*.

Figure 5.4 A mixed herd of yak, *khainag*, and possibly *ortoom* east of Bat-Ölzii *sum* center in the Upper Orkhon Valley, Övörkhangai *aimag* (image courtesy of Ellen Platts).

These hybrids all trouble the species concept, which is perhaps not a coincidence in pastoral contexts where they emerged. The close, interdependent relationships between pastoralists and their herd animals serve as an arena for the interplay between human intention and herd animal biologies. Biological species takes a backseat to the potentialities of multispecies entanglements.

5.3.4.2 Gestation

Gestation among mammals occurs along a developmental timeline over a fairly set chronological sequence for each species. Even in modern improved breeds, domesticated herd animals are pregnant for set lengths of time while their offspring develop in utero, with little successful modification of that timetable by humans. A herder who wants lambs and kids in spring must make sure that his ewes and nanny goats (dams) are successfully bred five months (give-or-take a few days) earlier. A cow who falls pregnant in early spring will calve in bleak midwinter, a perilous time for birthing and a newborn's survival; a knowledgeable and attentive herder keeps the constant receptivity and 9-month gestation period of cattle in mind for this reason.

Female domesticated herd animals are more vulnerable during pregnancy. They require more (and often different) food due to increased and novel nutritional needs. They are more vulnerable to disease and predation. The herder's imperative to care for their herd animals with specific reference to pregnancy and birthing will receive more attention in a subsequent section. But a failed pregnancy, where either the mother or growing offspring die, represents both an emotional and economic loss. Gestation is also the temporal link between breeding season and birthing season in a pastoral context.

5.3.4.3 Parturition

Birthing, or parturition, is also a vulnerable time for pregnant herd animal and their offspring. Domesticated herd animals, especially specialized breeds of certain species (i.e., dairy cattle and dairy sheep), may need human intervention during labor to insure the survival of mother and offspring. Dairy cattle and sheep tend to be multiparous (more than one offspring per birth) because greater milk production results from the increased lactation volume to feed multiple young. Hardier breeds of sheep, goat, cattle, and horse may generally require little hands-on human help during their breeding seasons, but complications in the birthing process and health risks to mother and offspring can occur in even the toughest, most autonomous breeds of domesticated herd animals. The most hands-on form of human care during parturition is quite literal: helping to bring newborn animals out of their mother's birth canal, by sending up a hand to the shoulder (in cattle) if necessary.

Although domesticated lambs, kids, calves, and foals are famous for their capacity to stand and run relatively quickly after birth, these are extremely vulnerable young animals in terms of temperature (weather), disease, nutrition, and predators. In *Living with Herds*, Fijn notes that Mongolian herders bring newborn kids and lambs together with their mothers into shelters for their protection (2011: 75). Mongolian herders use special containers for newborn lambs and kids – *khurgany uut*[41], literally "lamb bag" – who are born away from the household's encampment, keeping the infants safe and warm on their first journey home from far-flung pasture (Erdenetsogt, 2014: 364-365).

[41] Хурганы уут

5.3.4.4 Lactation

All domesticated herd animals of mobile pastoral lifeways are mammals. All female mammals have the capacity to produce milk in order to feed their young. Domesticated herd animals – especially sheep, goats, cattle, and horses – have been historically and are today regularly bred and raised for their milk production in Mongolia and around the world (Sadler et al., 2010). Until very recently, when humans gained the capacity to synthesize and administer hormones, mammals only produced milk after being pregnant. Live offspring were generally required to keep mother animals producing milk (lactating), who would 'dry up' otherwise in the absence of young to feed[42]. The mammary glands that produce milk in the five muzzled beasts come in pairs arranged into organs (i.e., udders); livestock udders vary in size, internal organization, and number of teats by species or taxon. For example, sheep, goats, and horses have one set of paired mammary glands with a teat per pair (i.e., two teats release milk from the udder), while cattle and (Bactrian) camels have two sets (i.e., four teats that release milk from the udder). The differing udder and teat morphologies contribute to the different techniques developed by and workloads required of humans who milk these livestock.

Milk itself has different biochemical qualities depending on species, by breed within a species (especially dairy cattle), and the individual (not all milkers are created equal: Muehlhoff et al., 2013; Warinner et al., 2014). "Each species of livestock produces not only different quantities of milk on a daily and annual basis, but milk with particular constituents important for human nutrition, as well as having different characteristics affecting processing" (Sadler et al.,

[42]Human milking by hand or machine can achieve the same effect on lactation as nursing offspring. However, in household-scale dairy economies the rigors of livestock birthing seasons often means that mother animals without nursing young cease lactating because no herder or pastoralist was available for consistent milking.

2010: 294-295). The milk from each of the five muzzled beasts, and even produced by different breeds or individuals within each taxon of livestock, varies in sensory qualities, like taste and feel: the musky tang of goat's milk; the thin, watery feel of raw mare's milk; the rich, unctuous aroma of yak's milk; the uniform smoothness of ewe's milk.

The volume and biochemical qualities of a lactating animal's milk also vary by phase within the lactation cycle[43]; for example, 'milkers' produce less and less milk after a production peak around 1-2 months after giving birth (Holstein Foundation, 2017). A major distinction between 'milks' of the same mother animal is between standard milk and colostrum. Mammary glands, including those of domesticated herd animals, produce colostrum during the first 24 hours of lactation (Merck, n.d.). Colostrum is unique in its color, viscosity, nutritional density, and centrality to newborn wellbeing by providing crucial antibodies and sustenance. All dairying economies, including industrial production, relies on successfully impregnating female herd animals (i.e., breeding), birthing of offspring, and the resultant lactation at the heart of milk production.

Even in a non-dairying pastoral economy, domesticated herd animal milk is essential to the successful propagation of a herd. It is not practical, and often impossible, to raise newborn herd animals without a lactating mother (either their own, or a willing surrogate) in mobile pastoral contexts, and even in many sedentary or semi-sedentary pastoral contexts. Until the 20th century and the advent of artificial or pre-made colostrum and milk supplement, newborn and young herd animals who were orphaned or rejected by their mothers were unlikely to survive. Both Fijn and Marchina document Mongolian herders who bottle fed motherless young herd

[43]Lactation cycle describes the time period from when a mother herd animal first begins producing milk after parturition to a human- or biology-mandated 'dry period' when she produces no milk. In dairy cattle, that cycle comprises: early lactation, mid lactation, and late lactation, and dry period (Holstein Foundation, 2017).

animals, a task that is time consuming and creates particularly close relationships between the 'orphans' and their human 'nursemaids'.

The capacity of female domesticated herd animals to produce milk, and generations (and millennia) of breeding by pastoralists to increase milk production in their herds, is fundamental to pastoral economies and lifeways. Milk is a central substance in Mongolian mobile pastoralism as both a vital sustenance for growing herd animals, as raw material for human foodstuffs, and as potent substance in ritual practice and cultural discourse (Thrift, 2014; Ahearn, 2021). Herders rarely consume unprocessed herd animal milk in Mongolia, choosing instead to curdle, boil, fry, ferment, cook, press, and/or distill milk into an impressive array of food and drink. The list of Mongolian mobile pastoral dairy products is long and varied (Erdenetsogt, 2014). Moreover, milk – of all herd animal species as well as of humans – figures in folk healing practices, ceremonies, and ritual observances across Mongolia today[44]. Milk is only available as a result of milking, a multispecies activity that dominates Mongolian mobile pastoral lifeways. Indeed, geographer Ariell Ahearn argues that, we should understand "milk and the work of processing milk into dairy products as a key element of social reproduction among pastoralist households" in mobile pastoral Mongolia (2021).

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[44]Domesticated herd animal milk is offered or scattered as part of myriad ritual practices. The centrality of milk in Mongolia is not limited to the milk of domesticated herd animals. Human mother's milk, together with nursing and breastfeeding, are widely viewed as positive and powerful in Mongolia today, including among urban Mongolians. The broader sacred landscape that encompasses *Khairkhan Uul* and *Sainshand* in Dorngov' *aimag* (eastern Gobi) includes a 'breast monument' where pilgrims offer milk to the double-cairns or mounds.

5.3.5 Bodily interactions between herders and herd animals: milking, birthing, and shearing

Living with Herds and *Making Community* recount numerous activities, events, and practices that comprise the days, seasons, and lifetimes of mobile pastoral life in Mongolia. These activities include: milking; lambing, kidding, calving (cattle and Bactrian camels), and foaling (i.e., livestock birthing); shearing sheep; combing or brushing goats, yaks, and Bactrian camels; riding horses, Bactrian camels, and sometimes cattle; herding on horseback or camelback; veterinary care; breaking and training horses and Bactrian camels for riding; training cattle to cart and yoke; branding and ear-notching; temporarily housing sick and vulnerable animals in the family's *ger* or home; castration; slaughter; sorting herd animals in pens and enclosures; saddling horses and camels; harnessing cattle; distributing fodder in winter; bottle-feeding orphaned or rejected young; *seterlekh*, or blessing a single herd animal to stand in as a 'living sacrifice' for the health and wellbeing of its entire herd (Fijn, 2015). These are all bodily interactions between herders and herd animals.

In *Making Community*, Marchina emphasizes the regular, long-term bodily interactions – including the activities listed above – between herders and herd animals within the context of what she describes as human-animal cohabitation ("la cohabitation homme-animal"). Marchina identifies three key mobile pastoral activities in mobile pastoral Mongolia that are comprised of close, complex bodily interactions: milking, birthing, and shearing. Of the three activities, Marchina singles out milking as a form of bodily interactions between herders and herd animals in Mongolian multispecies households and communities. She makes clear that, "[o]n a daily basis, the activity that involves the most numerous and common physical contact is milking"

(2015: 198)[45]. However, livestock birthing and the shearing, brushing, and combing of sheep, goats, yaks, and Bactrian camels in Mongolia also involve extensive, complex bodily interactions between herders and herd animals.

Fijn agrees with Marchina about the importance of milking in the multispecies herding households and communities she studied. Fijn extends her argument in the above passage about the centrality of milk to mobile pastoral Mongolia to milking as a way of creating and strengthening herder-herd animal relationships. "Milk is indeed of utmost importance in Mongolian pastoral society, not only nutritionally but as a strong mechanism for the continuing co-domestic relationship. Milking, rather than the more distant and less interactive herding, is a crucial part of the one-to-one interaction necessary for an animal to remain tame. Perhaps it would be more accurate if the herders' role were commonly described as "milkers" rather than "herders." Milking is crucial for both the link between the nursing mother and dependent young and between the female animal as the provider of milk and the human requiring milk for daily sustenance. If the animals were not milked, then the herd animals would not be particularly reliant on humans at all, as Mongolian native breeds do not rely on humans to be fed and are generally capable of surviving on pasture alone. The main reason why male animals do not become uncontrollable is that most are castrated before adulthood and are handled regularly during the early, formative stages of development during the milking process" (Fijn, 2011: 133-134).

In the above passage, Fijn articulates how milking builds the fundamental bonds and relationships between mother and offspring as well as between herders and herd animals. The previous section discussed how milking is possible thanks to the biological qualities and

[45]"Au quotidien, l'activité qui implique les contacts physiques les plus nombreux et les plus courants est la traite" (Marchina, 2015: 198).

capacities of sheep, goats, cattle, and horses in mobile pastoral Mongolia. However, Fijn specifies that milking as a practice is enacted through the bodily interactions between herders and herd animals.

5.3.5.1 Milking

Milking appears to be the multispecies herding bodily interaction par excellence. The activity "encompasses the close relationships between humans and livestock within the traditions of Mongolia pastoralism. These relationships are physical and embodied attunements between livestock and livestock caregivers that are often not examined in great detail in accounts of Inner Asia pastoralism" (Ahearn, 2021). In the multispecies herding households and communities of Mongolia studied by Fijn and Marchina, milking is a seasonal activity undertaken by women who milk lactating/nursing mother animals, those mothers and their nursing offspring, and other members of the household or community who help catch and hold the mother and young herd animals. In modern Mongolian mobile pastoral households, milking is a highly gendered form of labor. Milking is primarily the domain of women, who engage regularly and intimately with lactating female herd animals during the milking season for each species of five muzzled beast (Ahearn, 2021). Some evidence suggests the gendered character of milking as labor is a much broader pattern within pastoral lifeways in time and space (Sadler et al., 2010). A specific example from a mobile pastoral lifeway in a very different time and place are the Nuer as portrayed in Evans-Pritchard's eponymous 1940 manuscript, where in his discussion of Nuer dairying culture men are forbidden from milking in almost all scenarios (1940b: 21-26).

The regular bodily interaction engagements between herding women and mother herd animals during milking generate the kinds of close relationships between herders and herd animals emphasized in Fijn's and Marchina's ethnographies of pastoral Mongolia. The two ethnographic accounts indicate that affective and social ties between herders and herd animals grow stronger through milking, which may impact their bodies and behaviors.

Figure 5.5 A Mongolian herder milking a yak. Still image from *Khangai Herds* (image courtesy of Fijn, 2008).

Both ethnographers further stress a level of interspecies cooperation in milking. The necessity of that cooperation permeates Fijn's description of the bodily and vocal techniques used by herders in Mongolia to successfully milk their herd animals. "The activity of milking is a context that requires both vocal and bodily signals to elicit the amount of cooperation required for milking by hand. A female with a full udder can choose whether to release milk or not. The herding women encourage ewes to release their milk by exclaiming "*khos*" and slapping the udder with the palm of the hand, or encourage a mare by uttering a high pitched "*güürii*," alternated with sucking noises similar to the sucking sound made by a foal (the foal is also kept beside the mare during milking and fed briefly before and after milking).When hobbling cows, members of Choijo's family use different signals from Dogsomjav's family, because one family has predominantly *sarlag* and the other Mongol cows. Saikhanaa approaches a *sarlag* to hobble her for milking by saying "*khaa*," refraining from physically touching the *sarlag* but holding the tie used for hobbling in an outstretched palm. Perhaps this gesture to the *sarlag* has a similar function to the human wave, a non-threatening gesture, indicating that the tie is not a menacing object, like a stick. This technique is quite different from the one Lhagva uses to stop Mongol cows from walking around before she hobbles them: She places a hand gently on the rump and says "*oow oow*" (*ööv ööv*)" (Fijn, 2011: 117-118).

Figure 5.6	A pair of Mongolian herders milking a mare, with one holding the mare's foal near its mother to facilitate milking. Still image from *Khangai Herds* (image courtesy of Fijn, 2008).

Fijn relays milking as interplay between herders and the animals they milk. Rather than a relation of domination and control, milking in mobile pastoral Mongolia is a multispecies endeavor in which humans and herd animals must cooperate. Human intention may drive and direct milking as an activity, but herders must communicate with herd animals and enlist their cooperation for it to be a successful, feasible activity. Marchina makes a parallel point in her own work, arguing that "[t]he ease with which cows accustomed to being milked can be approached and touched is a result not only of a process of habituation, but also of the need for females to be relieved by being freed from their milk. This need is regularly mentioned by herders… Conversely, the fact that the cow lets herself be milked is perceived as an act of cooperation, formulated by the breeders in terms of the will to give. Mongolian and Buryat herders claim that it is the cows that decide when to milk and that if they can be milked, it is because they want to…By temporarily refusing human contact specific to milking, the cows therefore play a decision-making role in the milking schedule" (2015: 199-200). Ahearn recounts analogous dynamics between yaks, yak-cow hybrids, and the women who milk them, which sometimes escalate to yaks kicking over just-filled buckets of their milk in an act of dissatisfaction over being milked by a new person (2021). If one has industrial-scale dairy operations with robotic milking machines and thousands of lactating cattle in mind, the cooperative nature of milking sounds far-fetched. However, even in such overdetermined pastoral production schema, lactating herd animals must 'let down' their milk – releasing it from several chambers within their udders – in order for it to leave their teats (Holstein Foundation, 2017). How does a herder catch both a mother animal and her nursing offspring who do not want to be caught, when fences and barns are rare? How does a milkmaid lay into the manual rhythm of milking, hands and fingers on teats for as long as the mother will let her milk flow, when the animal shies away and dances in place, let alone when she kicks and bites?

Fijn conveys what it looks like when the animals who herders wish to milk do not feel like participating in the endeavor when she recounts a specific day of milking mares at one of the multispecies households in Mongolia. Milking horses in mobile pastoral Mongolia, as with milking cattle, usually involves a herder hand-milking the mother animal with at least one other herder bringing the nursing offspring to its mother's side to encourage her to 'let down' her milk. "Boloro milks while the men, Ochero and neighboring herder Nasaa, handle the feisty foals. Today was only the second day this season that the mares have been milked. The men catch the foals with an *uurga* by containing the herd in a purpose-built corral (unlike foals in Arkhangai, which are tame enough to be caught by hand). The foals are still very wary of being tied to the tethering lines and two of them pull on their halters frantically, attempting to run away but end up flipping over onto the ground. One was so exhausted from its escape efforts that it lay on the ground, heaving for breath. Another was persistently pulling, glistening and dripping with sweat through its fresh winter coat. A mare kept moving away when Nasaa tried to get the foal to nurse from her. Both mare and foal kicked out at him, the mare striking him hard on the inner leg, so that he could hardly walk for a couple of days. (Field note excerpt: Ochero's autumn encampment, October 18, 2005)" (Fijn, 2011: 138).

Figure 5.7 An *aduuchin* holding an *uurga* (lasso) at the Baruun Mukhdagiin Am site, Mogod *sum*, Bulgan *aimag* (image courtesy of Galdan Ganbaatar).

Figure 5.8 Foals in blue halters tied to a *zel* (tether line) while their mothers are being milked in Mogod *sum*, Bulgan *aimag* (image courtesy of Zagd Batsaikhan).

Figure 5.9 A line of foals secured to a *zel* waiting for their mothers to return from grazing for nursing and milking in Mogod *sum*, Bulgan *aimag* (image courtesy of Galdan Ganbaatar).

In the case of milking mares above, the bodily interactions between herders and herd animals can be physically demanding to the extent of causing distress, pain, and damage. More cooperative foals might have struggled less frantically on their tether line[46]. A more cooperative mare might not have kicked Nasaa the herder so viciously. This example illustrates that human intentions do not fully determine multispecies interactions, and that human control and domination does not accurately describe the dynamics that make mobile pastoral lifeways work.

A lifetime of milking exacts a painful toll on the bodies of women in multispecies herding households of modern mobile pastoral Mongolia. Extrapolating from a series of participatory ethnographic experiences, Ahearn argues that "milking is women's work and affects women's bodies and identities in particular ways" (Ahearn, 2021). She presents the poignant case of a yak herder who needed her grown son to find the right wife who would help her with the labor of milking their yak herd. The yak herder "suffered from headaches and joint pain, to the point where she would be crying with pain while doing the milking" (Ahearn, 2021). Thus, milking as a form of interspecies engagement illustrates that bodily interaction is not just momentary, but can accumulate in the participating bodies over seasons and years. The yak herder's joints most likely pain her due to joint wear and some form of arthritis resulting from a lifetime of gently, deftly squeezing milk from the hard-to-access teats of her yak cows.

Ahearn supports her case by drawing more broadly on her observations of the needs and pains of herding women's bodies in mobile pastoral Mongolia. She notes that, "[w]hen travelling with a *sum*[47] doctor around the countryside, he would often offer women massage for

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[46]A tether line for foals, or *zel* (зэл), is a long rope erected low and taut, and secured to the ground by pegs at each end. Individual tie lines run from the central rope to each foal, who are positioned alternating, daisy-chain orientation on each side of the central rope.
[47]*Sum* or *soum* (сум) is a territorial administrative unit in Mongolia roughly analogous to 'county' in the United States.

their backs, shoulders, and hands. Spending many days milking affects the knees. Generally, the work of Mongolian women is difficult on the knees, with much time spent kneeling, squatting, or sitting on low stools", including milking (Ahearn, 2021). These are activities bound up in milking and dairy production, which are considered mundane women's work yet comprise the "backbone of Mongolian pastoralism and culture" (Ahearn, 2021). The complexities of milking as a multispecies endeavor are unlikely to appear clearly in the archaeological record. However, the accounts of Fijn, Marchina, and Ahearn provide an empirical basis for interpreting bodily states (joint wear, physical trauma) as potentially linked to the broader categories of (mobile) pastoral lifeways discussed here.

The human element or intervention is as crucial in mobile pastoral lifeways as the biological and social qualities and capacities of domesticated herd animals. Fijn's and Marchina's analyses of multispecies herding households and communities both demonstrate that milking is a primary activity of mobile pastoral life in Mongolia. As their accounts show, milking is a bodily interaction between herders, mother animals, and their nursing offspring. Milking is thus an example of a broader point: that bodily interactions between herders and herd animals constitute the primary activities of mobile pastoral lifeways (in Mongolia).

5.3.5.2 Birthing

The birthing seasons and events of the five muzzled beasts – lambing, kidding, calving (for cattle and Bactrian camels), and foaling – involve a good deal of human labor and care into the biological processes of their herds. While many pregnant animals are able to birth their young with minimal herder intervention, others require additional or even major assistance. The previous subsection on Parturition outlined some of what human intervention into livestock birthing might involve; Marchina's account is more specific. "In general, herders are quite interventionist during calving ... herders intervene when [livestock birthing] takes place on the camp or in its surroundings and the female is in difficulty. According to herders, this is relatively common for cows and even more so for camels. Among the Buryats, I witnessed difficult calving in cows and lambing in ewes who could not expel their young due to abnormal positioning. The herder would then use their hands, or even their arms, coated with a Marseille soap type soap (ru. *hozjajstvennoe mylo*) to manipulate the calf in the uterus and allow it to come out. If the lamb or calf does not lift their head within seconds of birth, the breeder helps them by freeing them from the placenta that covers their head and possibly blowing in their muzzles and ears" (Marchina, 2015: 204-205).

Although Marchina describes herders' assistance during difficult calving and lambing at her field sites in Buryatia (Russia), rather than those in Mongolia, the methods she describes are used by Mongolian herders (Erdenetsogt, 2014) and pastoralists around the world. Herders help lambs and calves (and foals and kids) out of their mothers' wombs if they cannot be expelled from the womb and birth canal by the natural birthing process. Herders may need to help pull a lamb or calf that is partially on its way out of the birth canal if the mother is exhausted from labor or her offspring is too large. Truly difficult birthing involves what Marchina calls "abnormal positioning" of the offspring, which must be repositioned within their mother; reaching into the mother's uterus and re-arranging the peri-newborn without harming mother and/or offspring requires significant patience and expertise.

Figure 5.10 A herder blows into the ears of a newborn calf (still covered in afterbirth) to start it breathing as its mother looks on. Still image from *Khangai Herds* (image courtesy of Fijn, 2008).

Herder intervention and assistance in livestock birthing, including in mobile pastoral Mongolia, is a life-or-death matter. Once the biological cascade of birthing events begins in the mother animal's body, the offspring in utero have a time limit within which to leave her body before asphyxiating. A lamb, kid, calf, or foal that is stuck in its mother will die unless herders can free it within that time limit. Moreover, a mother animal who cannot birth her offspring herself will likely die unless someone removes her offspring (dead or alive) from her body. As Marchina recounts, a newborn safely delivered from its mother may need more help to take its first breaths. Herders, like pastoralists and veterinarians around the world, may need to clear mucus and afterbirth from the newborn's airways, blow air into its muzzles or ears, tickle its nostrils with straw, or rub down its little body to stimulate breathing and circulation. Problems that follow a live birth and the many techniques for addressing them may face a herder after this stage – getting the newborn to successfully nurse; hand-raising a newborn rejected by its mother;

supplement feeding a young animal whose mother does not provide enough milk; bonding a rejected or orphan animal to a surrogate mother (see Hutchins, 2019, for an extended description of Mongolian herders' techniques for accomplishing this feat); and so forth.

5.3.5.3 Shearing and combing or brushing

The majority of the domesticated herd animal species raised by Mongolian mobile pastoralists grow coats (hair follicles) that can be harvested and transformed into textiles. Sheep produce wool, which must be shorn with scissors (as in the Mongolian case), clippers, or shears. In Mongolia, goats, yaks, and Bactrian camels grow coats that can be combed and brushed to release hair classed as cashmere (Erdenetsogt, 2014). In order to gather these animal fibers, herders must shear, comb, or brush these herd animals during certain times of the calendar year. "More specific handling takes place during seasonal tasks such as shearing or combing animals. Mongolian and Buryat sheep are shorn every summer. Among the Mongols, shearing is done with scissors and requires tying the legs of the sheep so that it remains motionless on the ground while it is being cut ... In Mongolia, the other shorn animals, that is to say the camels, yaks and goats, undergo this operation in spring, in March or in April. The wool of camels is cut with scissors, while yaks and goats are combed with combs that collect the hair without damaging it. Most animals, used to having this operation every year, are calm and let it go without difficulty until the operation is complete" (Marchina, 2015: 205).

In mobile pastoral Mongolia, herders must catch and secure sheep, goats, yaks, and Bactrian camels in order to safely harvest their wool and hair. The act of shearing or brushing herd animals itself is a bodily interaction, with hands laid on animal bodies and wielding scissors and combs through thick coats, as is the catching and securing of those animals. Shearing and brushing or combing are not life-and-death matters, as in the case of livestock birthing, and they do not yield sustenance for herders or herd animals. However, the textiles that herders produce from the wool of sheep and hair of goats, yaks, and Bactrian camels are key for household subsistence and comfort as well as for exchange and market economic activities (the raw, unprocessed wool and hair is often sold directly on the market in Mongolia today). Wool and hair are biological qualities of sheep, goats, yaks, and Bactrian camels, but it is through herder-herd animal bodily interactions that those fibers become secondary pastoral products.

While the idiom of pastoral products and economic production are important for understanding mobile pastoral lifeways, Marchina highlights milking, birthing, and shearing as cooperative bodily interactions that create and strengthen relationships between herders and herd animals. During these activities "the animals, in particular when they have already been handled in these situations, let themselves be done without difficulty and sometimes even show signs of involvement in this activity: the cows return for milking, the goats approach the pastoralist to be tied up, the cow or ewe in difficulty for giving birth undergoes painful actions without trying to rain blows on the pastoralist. Beyond an interested process which aims at the well-being of the animal (which is freed from its milk or wool which has become too much) at the same time as it serves human interests, the behavior of animals in these daily activities shows a reciprocal cooperative commitment resulting from habituation process" (Marchina, 2015: 206).

Marchina further argues that bodily interactions between herders and herd animals – touch – are a means by which multispecies households undertake their lives together. "Human-animal cohabitation and the sharing of regular routines thus involve daily physical contact in very varied forms depending on the situation and the species. The occurrences and modalities of physical contact change with the habituation to co-presence and cooperation, becoming more suggestive than actually active. Therefore, touch plays a crucial role in the learning of cohabitation and cooperation, both for humans and for animals: it is as much the means by which animals and herders learn to know each other as the result of this knowledge ... The different ways of touching, essential in maintaining a human-animal community, highlighting concepts relating to animals which pastoralists expect to be cooperative" (Marchina, 2015: 247-248).

5.3.6 Interspecies cooperation: bodily interactions as 'co-work'

Bodily interactions between herders and herd animals illustrate the cooperative nature of multispecies herding households and communities in Mongolia. While milking, birthing, and shearing and combing are heightened examples of these interactions, they join a broad and varied daily repertoire of entangled activities, events, and encounters that constitute Mongolian mobile pastoral life. Fijn encapsulates the extent to which herder and herd animals lives are intertwined in each day of a mobile pastoral lifeway. "Herders rise at dawn for the first milking tasks of the day and go to bed soon after the sheep and goats are herded into the pen just after dusk. Herders sleep when the herd animals sleep and are active when the herd animals are active. Work roles vary depending upon the gender and age of the herder, and this coincides with the gender and age groups of the herd animals themselves. I would be unable to summarize the parallel lives of herder and herd animal more succinctly than Tim Ingold has done: "there is thus a sense in which people and their domestic animals grow older together, and in which their respective life-histories are intertwined as mutually constitutive strands of a single process" (Ingold, 2000: 86).

As my Mongolian friend Tuvshin put it, herders and herd animals "co-work together to survive"," (Fijn, 2011: 199-200).

In addition to the bodily interactions that involve a great deal of physical contact – milking, birthing, and shearing and combing – herders and herd animals "co-work together to survive" through numerous daily engagements of their bodies. The long list of activities, practices, and events of multispecies herding households and communities presented above constitute forms of "co-work" that makes a mobile pastoral lifeway in Mongolia possible. Moreover, *Living with Herds* and *Making Community* both indicate that bodily interactions between herders and herd animals are the primary activities of mobile pastoral lifeways of Mongolia.

Another way to articulate these bodily interactions is using what Fijn's friend Tuvshin described above as the "co-work" of herders and herd animals. An element of cooperation on the part of herd animals suffuses the above accounts of livestock birthing, milking, and shearing (together with combing and brushing). Much of the herders' portion of "co-work" is easily identified in these bodily interactions. Adept hands wield scissors through matted wool, free a newborn calf from the birth canal, and hold a bolting foal next to its mother for milking. Steady knees hold the milk pail under a letting-down udder, practiced arms lift lambs born out in frigid pastures into the *khurgany uut*, and strong backs help flip sheep onto their sides for shearing.

Herders' labor in the form of bodily interactions with their herd animals extends beyond livestock birthing, milking, and shearing. It includes but is not limited to: riding horses, Bactrian camels, and sometimes cattle; herding on horseback or camelback; breaking and training horses and Bactrian camels for riding; training cattle to cart and yoke; branding and ear-notching; castration; catching animals on foot, horseback, or camelback; slaughter; sorting herd animals in pens and enclosures; saddling horses and camels; harnessing or yoking cattle; distributing fodder in winter; bottle-feeding orphaned or rejected young; cleaning and binding wounds; splinting broken or injured limbs; and administering oral, topical, intravenous, or intramuscular medication.

Figure 5.11 A herding family sorts their sheep and goat using a circular wooden enclosure at their *ail* in Mogod *sum*, Bulgan *aimag* (image courtesy of Zagd Batsaikhan).

Figure 5.12 A boy lassos a horse with an *uurga* in a circular wooden pen. Still image from *Khangai Herds* (image courtesy of Fijn, 2008).

These bodily interactions between herders and their herd animals constitute the core of a mobile pastoral lifeway. But I suggest that a broader dynamic animates the human element of the “co-work” of mobile pastoralism, especially in Mongolia: care.

5.3.7 The human element in mobile pastoralism: care

One might be surprised at the centrality of care as philosophy and praxis in the life of a Mongolian herder, as Fijn was in the course of her ethnographic work. “Before my fieldwork I had not predicted the importance of care and protection in the daily lives of Mongolian herders and their livestock. A major part of the herders’ lives is engaged in the treatment of animal illnesses, using a vast array of techniques and an impressive knowledge of local medicinal plants. This knowledge is passed down from one generation to another and from one herder to another. Aagii emphasized this to me: ‘Traditionally, Mongolian methods for preparing young people to become good family members involve traditional education and this is how they learn to treat animal injuries. They maintain [this knowledge] from father to child and from these children to their children . . . In recent years Mongolian veterinary services have developed, so we have some clinical services but everyday life is very different. Herders often have to just manage themselves' ” (Fijn, 2011: 219).

In the above passage, the Mongolian herder Aagii identifies care as a key undertaking of Mongolian herders and a locus for important practices that maintain multispecies households. Care is a method and philosophy imbricated in what Fijn describes as the co-domestic relationships between herders and herd animals in mobile pastoral Mongolia. “A fundamental part of the co-domestic relationship is in nurturing health and general well-being” (Fijn, 2011:

219), or the care that Mongolian herders give to their herd animals. The health and wellbeing of individual animals impacts the health and wellbeing of the herd; the health and wellbeing of both directly impact the health and wellbeing of the people of the multispecies household. The herder Aagii makes the relationship between becoming a "good family member" and learning the expertise of herders' care a direct one. Care is the result of education in generations of inherited knowledge, and the development and practice of expertise over a lifetime. In the Mongolian mobile pastoral context, learning to give appropriate and skilled care to herd animals is part-and-parcel with becoming a herder. That care encompasses a vast array of expertise, skills, and practices that extend beyond utilitarian production.

Care can be construed to encompass numerous techniques that herders use to serve the needs of their herd animals. In *Making Community*, Marchina emphasizes the importance of touch and senses – sound represented by calls and vocalizations, smell – in the interactions and relations between herders and herd animals. Interspecies communication in Mongolian multispecies herding households is often the work of the body and its capacities. In this way, bodies and bodily capacities or qualities blur distinctions between human herders and their herd animals, or capitalize on shared or companion registers of being. Mongolian herders perform an expansive repertoire of vocalizations and calls for their herd animals; the repertoire varies by region, activity, purpose, species, and other axes that organize these multispecies herding communities. Natasha Fijn documented an impressive selection of this repertoire in her 9-part 2008 ethnographic observational film, *Khangai Herds*[48].

Herders even use music and song in their herding work and care, as exemplified in Mongolian traditions of singing to bond orphaned or rejected newborn livestock to mothers. A

[48] *Khangai Herds: an observational film in nine parts*. Accessed December 5, 2022. https://khangaiherds.wordpress.com/

practice within those broader traditions received great popular attention beyond Mongolia in the film, *The Story of the Weeping Camel*[49]. Mongolian interspecies musical practices extend beyond camels, as discussed by ethnomusicologist Kip G. Hutchins (2019) in his study of "lullabies for lambs" in the Middle Gobi of Mongolia. He notes that herders sing to orphaned lambs to bond them to new mothers, but specifically observes more than one singing style at play in this important method for ensuring the successful propagation of the herd in the Middle Gobi. Bonding vulnerable orphan lambs to surrogate mothers who will feed and raise them is a skilled form of care that encompasses affective, economic, sensory, and cultural registers of herding life.

Figure 5.13 A herder carries a lamb under each arm. Still image from *Khangai Herds* (image courtesy of Fijn, 2008).

[49] *Ингэн нулимс* (*Ingen nulmis*, lit. "the she-camel's tears") is a 2004 German-Mongolian production filmed in the Gobi desert among camel herders (*temeechid*) who enlist a local music teacher to perform the "Coaxing Ritual for Camels", added in 2015 to the UNESCO List of Intangible Cultural Heritage in Need of Urgent Safeguarding (https://ich.unesco.org/en/USL/coaxing-ritual-for-camels-01061), to bond a rejected newborn camel calf to its truculent mother.

It is tempting to leave the discussion of herders' care of their animals on this note. However, care in mobile pastoral lifeways encompasses practices and affects that trouble first-blush ideas about what care does and does not constitute. Fernando García Dory – a Spanish pastoralist, shepherding grassroots activist, and Regional Coordinator of the European Region for the World Alliance of Mobile Indigenous Peoples – articulates how the centrality of care to (mobile) pastoral lifeways troubles urban, industrial sensibilities. Speaking on behalf of modern pastoral communities in the European Union, he asserts that "pastoralists care for the flock as a collective, protecting thousands of years of breeding through conserving and indeed enhancing biodiversity. It is not so much about the slaughter of individual animals but caring for the collective – of the flock, the breeds and indeed the landscape. It is a symbiotic relationship of care, between pastoralists and animals. Many who do not understand pastoralism as a cultural system of production, intimately connected to animals and the environment, do not see this" (2021). Ethnographic accounts from mobile pastoral communities in Mongolia and adjacent environs attest to complex affective dynamics that shape and color the entanglements between herders and their five muzzled beasts. Care and exploitation are not mutually exclusive. Care is a dynamic within the mutual interdependence of five muzzled beasts and their herders, although this mutualism is asymmetrical (Peemot, 2017).

This co-work generates asymmetrical interdependence between the humans and nonhuman herd animals who dwell in multispecies herding households and communities together. That asymmetrical interdependence inculcates affective ambivalence around the realities of mobile pastoral lifeways. It is uncomfortable but deeply necessary to consider both the ambivalence and the realities from which it stems in order to better conceptualize the complexities of mobile pastoral lifeways.

5.3.8 Asymmetrical interdependence: realities and their ambivalences in mobile pastoralism

The interdependence between humans and their herd animals that constitutes herding communities in North Central Mongolia is evident to outside observers and to the herders themselves. "Mongolian herders and herd animals rely on one another in a reciprocal relationship of co-dependence. While I was in the field [North Central Mongolia], I realized how important the herd animals were to the herding families' everyday lives and ultimately for their survival…. As [one herder] succinctly put it, "We feed them and they feed us"," (Fijn, 2011: 241). The mutualistic, reciprocal character of this interdependence is clearly articulated by the herder: "we feed them, they feed us". Herd animals – their well-being, their bodies, and their lives – are essential to the lives and livelihoods of the Mongolian herders that Fijn observed and interviewed. Herders and their herds are interdependent, illustrating that mobile pastoralism in North Central Mongolia is a multispecies endeavor. Herders and their herds are 'in it together', engaged in relationships that are mutualistic if not egalitarian. Fijn continues that: "Mongolian herders view themselves as being in a reciprocal relationship with the animals they herd, such that if the herding family works hard to nurture and provide for the animals then in turn the herd animals will nurture and provide for the herding family, allowing them to live mutually interdependent, happy, and prosperous lives" (2011: 47). The Mongolian herding family in Fijn's account both recognizes that their well-being is bound up in the well-being of their herd animals and works to achieve that mutual well-being on daily, seasonal, and lifetime rhythms.

If Fijn's example suggests reciprocity between herders and herd animals, Marchina's work pinpoints the necessity of cooperation for that reciprocity to be achieved. "In pastoralism, humans and animals live and work together on a daily basis. This living together is not obvious, however. A reciprocal adaptation is necessary in order for powerful cooperative processes to emerge. However, this adaptation is not always immediately obvious, and it is often only when the animals stop collaborating that one notices how cooperative they had been before. Human-animal cooperation is so everyday that it is sometimes hardly noticeable. The pastoral way of life, involving humans and animals who live together and partly depend on each other, lends itself particularly well to a study which increasingly takes into account an animal perspective. This way of life requires mutual adaptation between humans and animals to enable them to live together" (Marchina, 2015: 8).

Note that cooperation and collaboration across species boundaries are required to make mobile pastoralism 'work'. Observing multispecies herding communities across Mongolia and in Buryatia, Marchina reveals another crucial factor that shapes mobile pastoral lifeways: the regular, daily nature of herder-herd animal interactions. This chapter will further discuss temporal rhythms of mobile pastoral lifeways in Mongolia, but again and again the consistent, long-term engagements between people and their herd animals plays a constitutive role in the intensity and ambivalence of their world-making relationships.

But the reciprocity and mutualism of multispecies entanglements, especially in the mobile pastoral communities in North and Inner Asia, of necessity include a fundamental asymmetry. Human herders kill their herd animals and put their bodies to a variety of purposes. The realities of killing, death, and consumption appear to occupy significant affective and cosmological terrain for Mongolian mobile pastoralists, as well as herders in nearby regions of North and Inner Asia (Fijn, 2011; Stépanoff, 2012; Peemot, 2017). In her ethnographic work in Tyva across Mongolia's northern border, Victoria Peemot closely attends to the complex relationship between Tyvan herders and their horses (2017) that combines practical, ideological, and affective registers of an interspecies entanglement. Tyvan herders raise many of the same domesticated herd animals as the Mongolian herders in Fijn's and Marchina's ethnographies. But Peemot identifies an intense, ambivalent affinity between Tyvan herders and their horses that may illuminate dynamics at work in other mobile pastoral contexts.

Peemot argues "[b]ecause Tyvan herders understand and relate to horses as they do with other humans, and because of the fact that Tyvan herders also slaughter and eat their horses (and horses do not slaughter and eat humans)…the interspecies commitment between humans and horses is asymmetrical. Horses pay for the human–horse commitment with their lives" (2017: 144). The overall dynamic of asymmetrical interdependence described by Peemot applies to other interspecies entanglements of mobile pastoralism. To extrapolate from Peemot's (2017) analysis, herd animals are called to give up their lives for herders, never the other way around. Humans regularly kill their animals as part of a (mobile) pastoral lifeway, as herders' dependence on their herd animals requires them to manage and carry out the deaths. A herder's prerogative and burden is to kill the animals that they raise and care for from birth.

This asymmetrical mutualism colors the entirety of mobile pastoralism as a multispecies endeavor. It sharpens the ambivalence animating a lifeway where human and nonhuman animal lives are lived in close, imbricated interdependence. However, in *Animal Intimacies* (2018), Radhika Govindrajan closes her ethnography of multispecies communities in the Central Himalaya by reframing the death she observed. "As the Australian feminist philosopher Val Plumwood (2008, 324) reminds us in a posthumously published essay, we need to rethink our concepts of death; we are all "food and through death we nourish others." Perhaps this recursive play between life and death, regeneration and degeneration, is what ties lives together in knots of relatedness" (Govindrajan, 2018: 176).

The recursive play identified by Govindrajan seems inherent to the co-communities and co-dwellings of multispecies worlds, where a being's death becomes sustenance for other living beings. In the mobile pastoral contexts of Mongolia, that recursive play between life and death describes the complex terrain of ambivalence and practicality within which the "we feed them, they feed us" philosophy operates. Care is not juxtaposed to killing, slaughter, and consumption. Rather, care in these mobile pastoral contexts must encompass and contend with the uncomfortable realities of life. The multispecies herding households and communities of Mongolia (and Tyva) practice a form of care that shapes Govindrajan's recursive play of life and death as a complex of ongoing asymmetrical relationships of interdependence.

5.4 Conclusion

Mobile pastoralism is productively understood as a multispecies endeavor, albeit one characterized by asymmetrical interdependence. Despite this asymmetry, human intention does not overdetermine mobile pastoral lifeways. Biological and social qualities of domesticated herd animals are realities that human herders can exploit, modify, or encourage, but they are realities outside of perfect human control or intention. Many of these biological and social qualities make mobile pastoral lifeways possible; how human herders respond to and interact with their herd animals' qualities over time will shape the bodies and lives of herders and their herd animals, and their jointly-inhabited social world.

Human-animal bodily interactions are the primary activities that constitute a mobile pastoral lifeway. These bodily interactions include direct body contact, bodily-mediated communication (vocalizations, visual cues), and body-to-body relations mediated by non-bodily objects (whip, lasso, halter, lead line, and so forth). The materially-mediated relationships between herders and their herd animals sustain the lives of herders and herd animals, transform herd animals into primary or secondary pastoral products, and allow herders to improve their livelihoods (particularly through riding, traction, and other forms of transportation). The detailed accounts of human-animal bodily interactions from Fijn's and Marchina's ethnographies of herding communities in Mongolia yielded specific examples of these bodily interactions, especially livestock birthing, milking, and shearing. Both ethnographers emphasize the importance of herd animal cooperation in these bodily interactions that suffuse the events, practices, and rhythms of this mobile pastoral way of life.

The material, bodily interactions between human herders and their herd animals quite literally make mobile pastoralism 'work'. These materially-mediated relationships occur in and through the bodies of humans and their herd animals. Thus, the biological and social qualities of herd animals discussed above, and how human herders interact with those qualities, determine and make possible the bodily interactions between herders and domesticated herd animals. The dynamic that describes how herders work and engage with their herd animals is care.

Care is the predominant human undertaking in a mobile pastoral lifeway. In order for herders to engage in asymmetrical relationships of interdependence with their herd animals that allow both to survive (and thrive), herders must care for their herds. That care includes but is not limited to: providing nourishment in the form of appropriate pastures, winter fodder, hand-administered milk to orphaned young, access to water, and minerals; protecting their animals from predators, disasters, and accident; administering veterinary care in cases of injury, illness, and complications to pregnancy, birthing, and the vulnerable first days of a young animal's life.

Mobile pastoral individuals and communities may provide additional forms of care, but the previous types of care are fundamental to maintaining herds.

Care is thus wrapped up in labor and intention, and describes a dynamic where the well-being of a domesticated herd animal is prioritized in a context of pastoral subsistence and economic production. Care of the herd animal ensures the well-being of the overall herd, the herder, and the herding household – the multispecies household (Oehler and Varfolomeeva, 2019) – in material as well as affective or cosmological registers that vary by individual and context, and often occur bundled together. Care does not delimit exploitation in these mobile pastoral contexts. Care that herders give to their herd animals constitutes a philosophy and method for negotiating the recursive play of life and death that characterizes existence in a multispecies world.

If mobile pastoralism can now be viewed as a multispecies endeavor, it raises questions about multispecies relationships themselves. Mobile pastoral lifeways of Inner Asia, particularly in Mongolia, constitute a particular set of multispecies entanglements; biological anthropologist Agustin Fuentes argues that "[b]eing with other species also epitomizes humanity. For at least the past 10,000–20,000 years, humans across the planet have been interacting with, manipulating and being manipulated by a diverse array of plants and animals. Some call this domestication, but it is best seen as a dynamic ecosystem involving humans and others shaping one another's bodies, physiologies and behaviors over space and time" (2020: 25). The subsequent chapter will expand upon this dialectic of multispecies entanglements that shapes the bodies of humans and other living beings through their long-term engagements by introducing two novel concepts: living materiality and relational osteobiography. However, it will first delve into multispecies entanglements and the world-building relationships between humans and other living beings, of which the multispecies herding households and communities of Mongolia form an intense and complex example.

CHAPTER 6

SHIFTING HUMAN-ANIMAL RELATIONSHIPS FROM ONTOLOGY AND ONTOGENY: LIVING MATERIALITY AND RELATIONAL OSTEOBIOGRAPHY

6.1 Introduction

6.1.1 Introducing living materiality and relational osteobiography

In this chapter I present two novel concepts – living materiality and relational osteobiography – drawn from a synthesis of human-animal studies, multispecies ethnography, materiality studies, social zooarchaeology, archaeologies of interspecies entanglements, theoretical osteoarchaeology, and bioarchaeology. What I call living materiality is a concept that asserts four fundamental points: 1) that humans and other animals are of necessity material entities, 2) that humans and other animals possess similarly dynamic, cognizant, and plastic materiality, 3) that the relationships between humans and other animals are thus materially mediated, and 4) that the relationships between humans and other animals generate the social worlds in which they dwell, and the humans and other animals engaged in those relationships particularly evident in their bodies. Living materiality thus shifts away from ontological debates on the nature of 'the animal' towards an ontogenetic vision of the mutual becomings of humans and other animals that are inseparable from their biological and social lives.

What I call relational osteobiography operationalizes the concept of living materiality through a combination of osteological analytical methods and insights from ethnographies and archaeologies of interspecies entanglements. Relational osteobiography articulates the durable remains of humans and other animals (bones, teeth, antler, horn, shell, etc.) as material embodiments of ongoing ontogenetic relationships that occur through, in, and on the interspecies bodies that engage in them. *Relational osteobiography* promises an analytical framework in which to productively examine the intentional associations of humans and other animals in time and space: living materiality in specificity of the bodies and lives of particular humans and other animals as producing and productive of the relationships that generate a given social world.

Living materiality as the foundational concept of this project draws inspiration from another source: personal experiences of interspecies entanglements in a pastoral context. The following vignette of living materiality recounts an event that constitutes a portion of the relationship between one human and one nonhuman animal (and then two and perhaps more) that itself comprises part of an assemblage of bio-social interspecies entanglements (small farmstead sheep dairying in present-day northwestern Washington state). In the following vignette, the recounted constitutive event overflows with the physical, visceral, and material nature of interspecies entanglements.

6.1.2 Lambing in April: a vignette of living materiality

The sun has not yet risen and already I am sweating. I have contorted and flexed my body into a moving wall. Trying to chivvy a heavily-pregnant ewe is like trying to dress a toddler mid-tantrum, except the toddler weighs at least as much as you do and has four expert legs on which to run. This particular heavily-pregnant ewe is Mousse, one of our champion milkers and a second-time mother. There's pre-birth on her rear – slick and glistening against the dull white of her woolly coat – and her vulva is pink from increased blood flow. Someone – at least one someone – is coming out into the world, and soon. In a semi-squat, I use the long span of my arms to cup the base of Mousse's tail in one hand and loop my other arm loosely around her neck. To negotiate Mousse's bodily resistance, I create the sensory illusion that my body is a wall that's slowly but unstoppably moving. And being a moving wall is a lot of work.

Finally in the birthing stall, Mousse paws at the floor aggressively, shoveling up the soft straw bedding and digging her cloven hooves into the compact rock sand beneath. I hurry up and wait, gathering lambing supplies and moving my arms and legs to stave off the dank creep of cold that permeates the early morning through the heavy padding of my overalls, jacket, and insulated boots. Eventually Mousse sinks to the birthing stall floor with a groan. I kneel in the stall with her, my thighs and back tired from pretending to be a moving wall, and I scooch surreptitiously closer with a fresh towel wedged under my heavily-padded arm. She strains and groans, stretching out her neck and curling back her upper lip as she pushes. Legs outstretched, pelvic joints popping, Mousse pushes until two little hooves emerge from her vulva. Like Mousse, they are white, and the cartilage of the tiny cloven hooves is so fresh it's translucent. More groans, more pushes, and eventually a tiny white muzzle appears above these forelegs, stretching the opening of the vulva to what seem like impossible dimensions. Mousse strains and strains, but no more of her baby makes it out of the birth canal. Only after she lies still and exhausted do I scoot to her side on my knees across the lumpy straw.

I place one hand on her heaving belly, where I can feel the flesh-swaddled form of at least one other baby stirring in her womb. With my other hand I gently grasp the two protruding little feet. They are slick with the jelly of the amniotic sac and small as cat's paws. My grip finds no purchase, and they slide out of my grasp again and again. Mousse groans and heaves. I wrap the clean towel over the little feet. Through my thin nitrile gloves I feel the nubbles of the cloth grip into the jelly, allowing me to take a firm hold around the hooves and pasterns. I pull only slightly, letting Mousse feel that another body is pulling along with her pushes. I slowly increase the strength of my pull until I feel the little joints stretch under the tension. Through the lamb's little legs I feel Mousse strain again, and I match my pull to her push; the three of us are balancing the work of birth through our bodies. The sharp edges of rock sand dig into my knees through the padded overalls and my hands ache from the delicate negotiation of tug and slack.

All of a sudden something comes loose; the lamb's shoulder blades have passed out of the birth canal. The newborn hangs, boneless and breathless, half inside its mother and half out in the dank cold of the birthing stall. It dangles in a state of limbo; I cannot see if it lives or died before birth. Defying the impulse to yank the lamb free, I let gravity spell me and gently pull the baby free of its mother. Mousse groans and heaves yet again, but this time she hauls herself to her feet. I dive forward, constrained by the full-body swaddling of my padded overalls and thick jacket. The baby slips loose, sliding and flopping across the rough, padded canvas coat encasing my arms. But the lamb has not yet breathed or opened its eyes. A thick, stubborn slime coats its whole body and soaks deep into its short, tightly-curled wool. Its head is encased in a helmet of yolk-like gunk, cutting off oxygen to the little nostrils and mouth. I wrap the nubbly towel around my gloved hands and prepare to swing all the slop and mucus out of the lamb's airways.

Left hand around the forelegs and right hand around the hindlegs, I test the newborn's size (weight and length) against the sureness of my grip and the dimensions of the stall with a few short, rhythmic swings. The lamb holds steady and I sense rather than think what comes next. I keep my arms rigid and swing the newborn back and forth between 2pm and 10pm, speaking to it all the while as though it had agreed to be swung around by its feet with its head flopping loosely. After a minute or so of this undignified carnival ride, I relent and place the newborn on the straw bedding. Through my gloves I can feel that the cold is already seeping into the lamb's skinny frame. I briskly rub down the little body, all bones and joints, with the dry, nubbly towel and clear globs of mucus forced out by all the swinging from the little muzzle's mouth and nostrils with the cloth and then my fingers. Only then does the newborn stir on its own, juddering and shaking under the novel weight of gravity. I press a syringe bulb into each nostril and pinch down hard, then the mouth, rotating orifices to suck out the viscous remains of life in the womb from the lamb's airways. I know I can go back to scraping off amniotic gunk when the newborn shakily lifts its head, opens baby-blue eyes, and mewls.

Her rear end smeared red with birth matter, the thick rope of umbilical cord hanging out of her as a literal life-line, Mousses rushes to her baby in a rustle of clean straw and matted wool. She coos and trills at her lamb, a persistent and affectionate croon unlike the yells and exclamations of bleating. Only as freshly-minted mothers do sheep ever make this sound. She continues to croon as she nuzzles her newborn, sloppily licking its face and body and slurping down all the jelly and gunk and afterbirth I haven't yet scoured away with the towel. I give Mousse and the new lamb a moment, exchanging out the sodden towel that is now cold and heavy for a fresh one. Gravity and Mousse's continued contractions ease more of the umbilical cord out of her and onto the birthing stall floor. I see an air bubble, faintly pink and shimmering, that indicates a second lamb is coming. Sure enough, Mousse leaves off her maternal slurping and goes back to groaning and pawing.

The newborn lamb flops ineffectually in the thick padding, both cloth and flesh, of my lap and arms. I grasp its long, gangly legs and flip it over to reveal a scarlet red umbilical cord and a deflated little sac; Mousse has had a boy. Slippery as grease and fine as silk, his umbilical cord slips out of my fingers several times before I successfully tie it off and hold him fast while the second shepherd dunks it (and much of the surrounding belly) in wine-dark iodine. In moments he will either kick and struggle to stand on his own, wobbling to Mousse's enormous udder to butt and poke and probe at his mother until he successfully sucks down his first gulps of life-sustaining colostrum; or I will have to tube him: slowly feed a thin line of plastic tubing into his mouth, down his throat, and directly into his stomach to fill his empty belly and jumpstart his new life out of the womb. For now, the little boy lamb lays sprawled across the thick canvas of my overalls, roughly massaged by the same kind of nubbly towel that pulled him into this world front-feet-first. I, too, lay sprawled with my tired back against the use-smoothed wooden wall of the birthing stall, my legs stretched out into the straw. My work is not done; the newborn lamb's work is not done; Mousse's work is not done. But so far we've all succeeded together. The little boy lamb lets out a mewling infant's bleat, struggles and flops forward, and balances precariously on his translucent little hooves. He readies himself to edge off of my lap and towards Mousse and her mother's milk, from one bodily station in his life's journey to another.

The preceding vignette of living materiality suggests the dynamic, interactive qualities of interspecies entanglements that are bodily interactions between humans and other living beings. My preceding encounter with Mousse the ewe and her newborn lamb is a moment of bodily, material engagement. Our relationships, of which this vignette is an eventful snapshot, are materially mediated. Our bodies work together, combining intention and biology across boundaries of species and individual, and are materially impacted through our interaction. My sore back, the mother's groans, the newborn's gelatinous mucus, the tang of wet wool, and the push-and-pull of lamb, ewe, and human are visceral realities that comprise a specific, particular example of interspecies entanglements. Indeed, material mediation is a crucial dimension of those entanglements and problematize the discreteness assumed by categories of social vs. biological vs. natural vs. intentional.

The April morning when Mousse birthed her lamb concretizes concepts like "interspecies entanglement" or "human-animal relationship" that encompass a dizzying array of interactions, practices, and beings. While that April morning was one event in daily, years-long relationships between me, Mousse, and her lamb (Helado) that was made possible by numerous interactions and events involving me, Mousse, the second shepherd, a breeding ram, and the rest of the flock. Mousse was once like Helado, emerging from her own mother into our helping hands, and grew over years on green pasture in summer and harvested fodder in winter into an adult ewe who bred to Helado's father, another sheep with a life history similarly entangled with other lives and bodies and events. That April morning made numerous other, as-yet unfolding rhythms of pastoral lives possible. Mousse birthing Helado with my help that April morning was an event that would help make milking season possible: Mousse's milk would fill her udders, and this milk would nourish Helado and his siblings, fill the stainless steel milking pail each evening, transform through heat and microbes and citric acid and enzymes and generations of family and cheesemongers' recipes and human hands into mozzarella, yogurt, and brie.

The following chapter lays out the theoretical basis for two interrelated and novel concepts – living materiality and relational osteobiography – introduced above. As the project dives into dense theoretical terrain to explicate these concepts, the reader may find the April morning vignette a welcome touchstone. The human's sore back, the mother's groans, the newborn's gelatinous mucus, the tang of wet wool, and the push-and-pull of lamb, ewe, and human stand as specific, embodied, and material examples of what these concepts are meant to elucidate.

6.2 The Material, Interspecies Constitution of Social Worlds

Within the last few decades, two 'turns' rocked foundational conceits upon which the social sciences and humanities operated: the 'animal turn' and the 'material turn'. The 'animal turn' encompasses the myriad approaches to nonhuman animals that reveal and problematize the constitutive elements that comprise the subject – the rational and language-using human – of history, sociality, and representation (Calarco, 2008; Wolfe, 2008). The 'animal turn' takes aim at the ontological and ethical claims around subjectivity, especially powerful in its extension of feminist and postcolonial critique in such a way that "nonhuman animals have become a limit case for theories of difference, otherness, and power" (Weil, 2010: 3). In anthropology and related disciplines, the study of human-animal relationships embraces these theoretical and political critiques of how nonhuman animals are characterized in the philosophical framework of the human sciences and have initiated a turn towards the analysis of the relationships that make up a given social world (Haraway, 2003; Livingston and Puar, 2011; Tsing, 2015). Multispecies ethnography (see Kirksey and Helmreich, 2010) embodies the productive, fecund application of these theoretical engagements to empirical contexts by asking "what happens when *Homo sapiens* and its interspecies, multispecies, and quasi-species familiars, burrow into the biology that animates anthropos?" (566). Thus, when interspecies entanglements (Livingston and Puar, 2011) are examined as imbricated, complex practices that constitute humans and other animals and the worlds they inhabit, ontogenetic processes emerge as more analytically productive than the ontological binaries of traditional social thought (Tsing, 2015).

The 'material turn' places the human subject in a material world, arguing that the human experience is fundamentally inseparable from objects, materials, landscapes, and other forms of matter (Latour, 1993). The 'material turn' in the social sciences argues for the study of things – objects and materials – in themselves and in their networks of relationships in order to elucidate the social worlds which anthropology seeks to understand (Ingold, 2007; Bennett, 2010). Within the wider 'material turn', materiality studies "have argued persuasively for the co-constituted nature of things and social practices…The materiality movement has succeeded admirably in resuscitating the object world as an analytical concern beyond the disciplinary confines of archaeology" (Smith, 2015: 30).

Multispecies ethnography and the study of human-animal relationships share with materiality studies the transformative insight that the human experience is of necessity imbricated in and constituted by the nonhuman: other life forms, things, and landscapes. However, these fields' distinct genealogies and objects of analyses require a bridging concept to capitalize upon their analytical power to investigate and elucidate the social worlds which anthropologists seek to understand. I therefore introduce the concept of living materiality to put these two streams of anthropological inquiry in conversation. Living materiality brings to multispecies ethnography and the study of human-animal relationships the insight that interspecies entanglements are materially mediated. Living materiality brings to materiality studies the insight that humans and other animals are material. I develop the concept of living materiality in order to maximize understanding of the contingent, mutually-constitutive potentialities of human-animal relationships and how they generate social worlds which anthropologists seek to understand.

In order to deploy living materiality, I introduce the idea of relational osteobiography as an analytical tool for empirically examining interspecies entanglements of humans and nonhuman animals in specific contexts. Relational osteobiography combines methods and theoretical insights from social zooarchaeology, bioarchaeology, and theoretical osteoarchaeology (Sofaer, 2006) to facilitate an archaeological examination of how specific human and nonhuman animal bodies in a given context constituted and enacted material realities and ideological projects of that context. The bodily material realities of interspecies entanglements that comprise mobile pastoral contexts generate ideal empirical scenarios in which to apply living materiality and relational osteobiography. In the subsequent chapter, I argue that the mobile pastoral Xiongnu, who buried herders and domesticated herd animals together in tombs at the Elst Ar cemetery in Central Mongolia, present the most productive and compelling context for an application of a concept and an analytical framework designed to demonstrate the potential of understanding human-nonhuman animal relationships as materially-mediated interactions that constitute and are constituted by social worlds.

6.3 Ontology, The Anthropological Machine, and The Ontological Turn

In the humanistic sciences, the relationship between humans and nonhuman animals has traditionally been theorized on ontological grounds. Questions of human nature and states of being posed in opposition to nonhuman animals invoke a fundamental assumption of ontological difference between human and animal. An ontological framework that relies on the categorical differentiation of humans from nonhuman animals pervades the broader Western tradition of philosophical and humanistic thought, a genealogy of moral and political thought to which a bulk of ‘animal turn’ scholarship critically responds (Berger, 1980; Latour, 1993; Agamben, 2004; Weil, 2010). In this framework, the concept of ‘human’ summons an oppositional counterpart: the ‘animal’. How this categorical differentiation operates is most succinctly articulated by

Giorgio Agamben in *The Open* (2004). Agamben introduces the concept of the *anthropological machine*, which generates a pair of oppositional categories whose contours and contents are contingent and under constant negotiation: 'human' and 'animal'. The anthropological machine represents an extension of Agamben's arguments in *Homo Sacer* that "the inclusion of bare life in the political realm constitutes the original – if concealed – nucleus of sovereign power. *It can even be said that the production of a biopolitical body is the original activity of sovereign power*" (*italics original,* 1998: 11). This account presents the differentiation of bare life and life as imbued with ethical and humanistic value as the foundational work of biopolitics. In *The Open*, Agamben voices a parallel concern with differentiation and opposition that works on a concept of life.

Citing Aristotle's identification of 'life' as a foundational category that was identified but not defined, Agamben argues that "everything happens as if, in our culture, life were *what cannot be defined, yet precisely for this reason, must be ceaselessly articulated and divided*" (2004: 13: emphasis Agamben). Aristotle organized living beings through division and exclusion such that 'life' became "the hierarchical articulation of a series of functional faculties and oppositions" (ibid: 14) rather than provide an ontological definition of 'life'. These divisions and exclusions within living beings enable 'human', which exists strictly in opposition to 'non-human' or 'animal' *within* the same being. Rather than be taken in by the 'anomaly' of human as a collection of divisions within 'life', the ways in which these divisions and exclusions have proceeded are the proper target of critical interrogation. Such divisions and exclusions are neither ontological nor metaphysical statements but "the practical and political mystery of separation" (ibid: 16). The key work of the anthropological machine is differentiation of biological life into ontologically-opposed categories: rendering certain beings subjects and other objects. These subjects comprise the category of 'human' in fundamental contrast to the objects of the 'animal' category. Thence differentiated, beings may be accorded or stripped of rights of moral, metaphysical, and political subjectivities, and bodily sovereignty (Calarco, 2008).

An interdisciplinary movement under the aegis of the 'animal turn' has emerged to interrogate the workings of the anthropological machine (Agamben, 2004) that differentiates human subjects from physical objects, notably including nonhuman animals (Descola, 1996; Haraway, 2003; Latour, 2004, 2005; Deleuze and Guattari, 2007; Derrida, 2009; Livingston and Puar, 2011). Social theory, anthropology, and philosophy have generated trenchant critiques of 'the animal' and the human-animal boundary for their ontological deficiencies (such as 'human' vs. 'animal': see Calarco, 2008, and Weil, 2010, for thorough overviews of these critiques) and their unacknowledged biopolitical valences (Livingston and Puar, 2011). At the same time that these foundational ontological binaries came under attack, accounts and interpretations of natureculture production and interspecies entanglements prompted a reorientation towards the importance of ontogenetic interactions and processes in the continual emergence of the phenomenal world (Haraway, 2003; Tsing, 2015).

Relatively recent contributions by (social) philosophers, sociologists, and (cultural) anthropologists have served to challenge deeply-held and long-standing Western ontological conceits about the phenomenal world as a sphere of radically opposed binaries: 'culture' vs. 'nature', 'subject' vs. 'object', and 'human' vs. 'animal' (Latour, 1993; Descola, 1996; Sofaer, 2006; Bennett, 2010; Livingston and Puar, 2011; Kohn, 2014; Tsing, 2015). Some of the most destabilizing critiques of modernity and its pet concepts have been mounted at the discursive level and target the distinct but interrelated topics of 'the animal' and the human-animal boundary (Agamben, 2004; Deleuze and Guattari, 2007; Derrida, 2009). These discursive critiques of 'the animal' and the human-animal boundary have been channeled into productive re-theorizations of the ontological framework with which to consider the phenomenal world through the lens of human-animal relationships (Latour, 1993, 2004, 2005; Haraway, 2003). Although some of these critiques (Deleuze and Guattari, 2007) include the significance of ontogenetic phenomena and interrelations to a limited extent, 'the animal' and the human-animal boundary as broached at the discursive level are primarily engagements with ontology.

Theoretical critiques against this Western philosophical framework argue that the radical opposition of humans and nonhuman animals produces very real political and ethical consequences that can be identified in institutions of authority, including the state and the sovereign (Derrida, 2009). Specific historical events center upon highly disturbing weaponizations of the anthropological machine creates through a rigid, ontological distinction between 'human' and its ultimate other, 'animal'. Historical moments where certain peoples were relegated to the ontological 'animal' category in order to dehumanize them and justify their oppression, enslavement, domination, or extermination are too numerous to document; the 20th and 21st centuries alone bloat with casualties of the anthropological machine. Some particularly devastating examples include Nazi Germany's classification of Jews as 'lice'; calling the Tutsi ethnic minority 'cockroaches' and 'snakes' during the Rwandan genocide; US designation of terrorists as subhuman after September 11th (Kosek, 2010); and current US rightwing discourse about myriad nonwhite communities and individuals (see Trump explicitly called Latinx people immigrating to the US 'animals'). Thus, dismantling the anthropological machine has the potential to reveal and excoriate the theoretical roots of projects of domination, exploitation, fascism, and genocide. (Agamben, 2004; Deleuze and Guattari, 2007; Calarco, 2008).

Myriad instantiations of the ‘ontological’ or ‘posthuman turn’ that fall under or adjacent to anthropology’s big tent grapple with the global ecological crisis that confounds humanistic sciences conceptually reliant on the ontological distinctness and primacy of the human (Bennett, 2010, 2013, 2015; Hodder, 2012; Kohn, 2015; Tsing, 2015). Admirable political goals animate the radical theorizations of a world freed from the overdetermined Western ontological binaries: saving our planet and the biotic life that dwells there from a rapacious, dominating, and annihilating global capitalist system rooted firmly in those binaristic oppositions (Latour, 1993; Bennett, 2010; Tsing, 2015). The stakes of ontological destabilization are extremely high. Yet questions remain regarding the nature and operation of agency in a posthuman ontological framework; a full discussion of ‘agency’ and its mobilizations in posthuman or materiality studies literature is beyond the scope of this project, but see Adam T. Smith’s *The Political Machine* for an incisive examination of key issues. With the presumed radical distinction between ‘human’ and ‘animal’ under sustained critique on ontological and ethical grounds, it is reasonable to question the usefulness of continued inquiry into humans in relation to animals that operationalizes radical ontological difference between such categories. At this juncture multispecies ethnography and allied approaches raise the question of posthuman or alternative ontologies, which themselves open the analytical door for a shift from ontology to ontogeny. An ontogenetic framework characterizes humans in relation to nonhuman animals as emerging through their myriad interactions over time, rather than their transcendental properties.

6.4 Multispecies Ethnography and The Co-Constitution of Social Worlds

In the introductory essay to the special issue of *Current Anthropology* on multispecies ethnography, Eben Kirksey and Stefan Helmreich describe the theoretical and methodological orientation of this subfield of anthropology as "center[ing] on how a multitude of organisms' livelihoods shape and are shaped by political, economic, and cultural forces" (Kirksey and Helmreich, 2010: 545). Accounts from multispecies ethnographers demonstrate that not all societies assume an insurmountable categorical distinction between humans and other living beings (Descola, 1996; Viveiros de Castro, 1998; Ingold, 2000; Willerslev, 2004; Vitebsky, 2005; Fausto, 2007; Kohn, 2007); some expand this realization into arguments that alternative ontological schema that operate on multiplicities of natures and a shared culture across species boundaries constitute the social worlds targeted in ethnographic encounters (Descola, 1996; Viveiros de Castro, 2004; Kohn, 2015). Ethnographers, anthropologists, and other social scientists vigorously debate the philosophical and political stakes of the so-called 'anthropology of ontology': does it attend to contextual and contingent formations of power in context as it simultaneously generates 'other' social worlds and futures (Viveiros de Castro, 2014) , or does it reify present contingencies and inequities as transcendental universals (Bessire and Bond, 2014)?

Further examples from multispecies ethnography prompt a consideration of ontogeny – coming-into-being over time or specifically a lifetime – as the more productive arena for examining the relationships between humans and other animals that generate social worlds. These multispecies ethnographic accounts of how human-animal relationships constitute these contexts work to challenge the idea that animals are acted-upon objects (Descola, 1996; Viveiros de Castro, 1998; Ingold, 2000; Masco, 2004; Willerslev, 2004; Vitebsky, 2005; Fausto, 2007;

Kohn, 2007; Nasady, 2007; Fuentes, 2010; Raffles, 2010; Fijn, 2011). Research along this avenue shows empirically that the mutability and contingency of a being's personhood in time and space (Munn, 1970, 1986; Gell, 1998) make the *relationships* between humans and other animals of primary significance (Nasady, 2007; Raffles, 2010; Fijn, 2011). Human-animal relationships constitute social worlds that are both natural and cultural; they are contingent and complex interactions that occur at diverse temporalities, and are in turn constituted by the institutions, sensibilities, and communities that they shape (Haraway's "naturecultures": 2003, and Tsing's "multispecies worlds": 2015; Masco, 2004; Raffles, 2010).

While multispecies ethnographies explore interspecies entanglements beyond representatives of Animalia[50] as far as all carbon-based lifeforms, the relationships between humans and nonhuman animals they detail emerge as uniquely agentive, interactive, vibrant, and affectively complicated. Specific ethnographic examples of human-animal relationships reveal them to be complex and particular intersections of biology, history, political ecology, political economy, cosmology, affect (see Kirksey and Helmreich, 2010): Eveni herders and their self-sacrificing reindeer (Vitebsky, 2005), Runa hunters and their dreaming dogs (Kohn, 2007), the US military-industrial complex and its drafted honeybees (Kosek, 2010), Mongol pastoralists and their co-domestic herds (Fijn, 2011), Shanghai trainers and their fighting crickets (Raffles, 2010), and the shared suffering and livelier livelihood of permaculture pigs and their farmers in rural America (Emel et al., 2015; Blanchette, 2020). Each set of human-animal relationships listed above is particular in its historical specificity, affective landscape, and material configurations. Multispecies ethnographies often attend to these interspecies entanglements by

[50]Linnaeus, 1758: Kingdom Animalia, Domain Eukaryota. Multispecies ethnographies consider viruses, bacteria (eukaryotes and prokaryotes), and plant life, and their imbrications with humans and other animals (Lowe, 2010; Blanchette, 2015; Tsing, 2015).

articulating an assemblage of companion species to account for the contingent, open-ended nature of the world-making projects that constitute different yet overlapping social worlds.

Anna Tsing's *The Mushroom at the End of the World* (2015) and Donna Haraway's *Companion Species Manifesto* (2003) marry ethnographic detail and insight to conceptual apparatuses that enable others to follow in their footsteps. Tsing and Haraway share an assemblage sensibility, which recognizes the contingency and historical specificity of the relationships and interactions they explore. They also tack between scales and foci – bodies, individuals, landscapes, narratives, histories – to capture the biosocial complexity that multispecies ethnography promises to reveal.

Donna Haraway's *Companion Species Manifesto* (2003) crafts an analytical framework capable of interrogating the implications of a shift from ontological divisions to ontogenetic imbrications in anthropological consideration of human-animal relationships. Haraway's framework incorporates the multispecies ethnographic position that human-animal relations are interspecies entanglements in material and lived specificity contoured by complex temporalities into an analytic framework for understanding humans and other animals as co-constitutive and generating their social worlds through their complex, ongoing interactions. Thus, specific naturecultures (Haraway's term for social worlds, multispecies worlds, or biosocial contexts) arise from interspecies entanglements where ontological distinctions give way to ontogenetic becomings (Kohn, 2007: 13; Fausto, 2007) that prioritize interactions between social, material beings (Munn, 1970; Descola, 1996; Kohn, 2007). These interactions have broader political consequences in that series and various scales of the entanglement of radical others produce and mimic relations of dominance and submission that constitute a variety of naturecultures (Kohn, 2007[51]).

The most vivid ethnographic depictions of the *interspecies entanglements* and *multispecies worlds* presented by Haraway and Tsing, respectively, push these concepts to confront and account for interspecies interrelationships that are not solely made up of affective ties with positive valences (Vitebsky, 2005; Fausto, 2007; Kohn, 2007; Raffles, 2010). Ethnographies of interspecies entanglements recount the complex, messy, and frightening material realities of interspecies entanglements that can hardly be unique features of the modern world. To collect and cohabit in Japanese *mushi* natureculture is to kill and curate (Raffles, 2010); the deep-time relations between Eveni and their reindeer unfold in life and on into death (Vitebsky 2005); humans, dogs, jaguars, and peccaries in Amazonia intertwine through relations of predation, consumption, contagion, and signification (Fausto, 2007). Kluane hunters are bound up in networks of exchange with other-than-human persons in ambivalent reciprocity of life and death (Nadasdy, 2007). Ambivalent, unsettling insights into the interspecies entanglements that compose these and other specific naturecultures necessitate an anthropological perspective on human-animal relationships capacious enough for the complexities of life and death across many lives and deaths. This is particularly true in mobile pastoral contexts where humans and at least one species of herd animal lead close, interdependent lives. Ethnographic accounts from Mongolia (and North and Inner Asia more broadly) presented in Chapter 3 illuminate the intense dynamics of multispecies interdependence,

[51] But see Boyd (2017) for a critique of multispecies ethnography on the grounds that it excuses human culpability in present ecocrises and that it "risks effacing the distinctiveness and agency of nonhuman animals in a leveling out" (303).

interdependent, and sometimes uncomfortable dynamics of an inescapably multispecies endeavor.

Ethnographic perspectives provide powerful and fine-grained insights into the complex interspecies entanglements that constitute social worlds, especially the multispecies herding households and communities of present-day Mongolia (see Chapter 3). However, ethnography of necessity operates within a short timeframe. Fortunately, methods and analytical frameworks exist within anthropology that can account for centuries and millennia of human-animal relationships: zooarchaeology and bioarchaeology. As modes of knowledge production that focus on the biological remains of humans and other living beings, zooarchaeology and bioarchaeology are further equipped to investigate the material dimensions of interspecies entanglements that elude ethnographic inquiry. Social zooarchaeology in particular has worked as a field to bridge the intellectual and practical divides between human agents and inert objects through its focus on nonhuman animals as participants in past social worlds.

6.5 Social Zooarchaeology and The Materiality of Nonhuman Animals

Recent directions in archaeological and anthropological thought have pushed scholars to explore the social relationships between humans and objects and relationships between humans mediated by objects to argue that engagements with materiality over time constitute and are constituted by social worlds (Gell, 1998). The tendencies of objects to embody agentive qualities greatly interest many anthropologists and archaeologists, who envision “biographies” (Appadurai, 1986; Gosden and Marshall, 1999; Meskell, 2015), “affordances” (Knappett, 2004), and other vibrant capacities (Buchli, 1999; Holtorf, 2002; Miller, 2005; Hoskins, 2006;

Knappett, 2010). Despite research into the lives of objects and their capacities to exert influence on people, archaeologies and anthropologies of materiality have consistently avoided direct consideration of the materiality of animals.

The nonhuman animals that engage or have engaged with humans since the emergence of the genus *Homo* certainly display those characteristics that interest anthropologists and archaeologists in material objects: they associate with humans in a wide variety of societal contexts, they lead biological and social lives that are not fully reducible to their interactions with or control by humans, and regularly act under their own volition. This is particularly true of animal materials (see Conneller, 2004), the aspects of nonhuman animals like shell, bone, and antler that grow and develop during the life course but endure long after death. Such animal materials are frequent objects of analysis in research on materiality, including classic studies of objects constitutive of social worlds. For example, the *kula* ring famously analyzed by Malinowski (1922) and Mauss (1990) is the exchange of two kinds of mollusk shell.

Most research on this theme considers the material bodies of animals to a limited extent or elides animals entirely. However, this is beginning to change in archaeology, thanks to innovative work within the domain of social zooarchaeology (Conneller, 2011; Overton and Hamilakis, 2013; Chazin, 2016). Social zooarchaeology is a movement within zooarchaeology, one of the largest constitutive subfields within archaeological knowledge production that centers on the nonhuman animals in past social worlds. Zooarchaeology has traditionally studied the multiple roles and uses for animals in past societies to gain ecological, economic, and symbolic information on those contexts. The ecological context and seasonal behaviors of past peoples are directly informed by the animal remains recovered from their habitation contexts (Miracle and O'Brien, 1998; Rivals et al., 2009). Animal remains have been the primary means to reconstruct dietary practices in past societies as proxies for humans (Clutton-Brock and Noe-Nygaard, 1990) or as the remains of their meals under changing ecological and demographic conditions (Schibler et al., 1997; Stiner et al., 1999). Interpretations of available animal remains have been used to argue whether early humans scavenged or hunted (Binford et al., 1988; Stiner, 1990; Dominguez-Rodrigo, 2002). The ways in which humans exploited animals through hunting strategies and herding practices for their meat, milk, bones, horns and antlers, wool, hides, and innards depend upon close analysis of recovered animal remains from archaeological contexts (Sherratt, 1981; Bratlund, 1996; Arbuckle et al., 2009; Towers et al., 2011). The resultant analyses empirically inform past economic structure and practices in all archaeological contexts, including the emergence and maintenance of complex societies (Zeder, 1988; Crabtree, 1990).

Zooarchaeologists have explored the symbolic roles of animals in past societies as seen in food taboos (Politis and Saunders, 2002), the production of memory through their spatial distribution in the landscape (Jones, 1998; Brown, 2005) and architecture (Hodder, 1990; Meskell, 2008), and as ideological resources in ritual sacrifice and feasting (Potter, 1997; MacKinnon, 2010; Russell, 2011). Human-animal relationships have been central to an understanding of animal domestication as a complex social and biological process (Bökönyi, 1969; Meadow, 1989; Clutton-Brock, 1992; O'Connor, 1997).

While zooarchaeology studies human-animal relationships from multiple perspectives, most analyses treat animals as the objects of human behavior and intentionality (Russell, 2011). However, recent social zooarchaeological research on the polysemous nature of animals has extended their roles beyond symbolism and subsistence and into realms of personhood and interspecies relationships, such that the focus becomes the processual and material production of past social worlds (Connoller, 2004; Casella and Croucher, 2011; Losey et al., 2011; Russell, 2011; Boyd, 2017). The theoretical innovations of this movement are embodied in Nick Overton and Yannis Hamilakis's *A Manifesto for Social Zooarchaeology* (2013). Overton and Hamilakis forward a bold vision of social zooarchaeology that breaks ontologically with the anthropocentrism of previous research on nonhuman animals in archaeological contexts that uses nonhuman animals as proxies for or mediators of human-human relationships (2013). Their manifesto articulates an agenda for zooarchaeological analysis that recognizes the agentive qualities of nonhuman animals, the world-building and mutually-shaping capacities of human and other animals in their interspecies entanglements, and the sensuous, visceral, and affective qualities of these entanglements (ibid). To illustrate the potentials of this agenda, the manifesto presents two empirical cases studies of whooper swans in Mesolithic Denmark, emphasizing that the analytical methods deployed therein derive almost unchanged from existing zooarchaeological techniques, including: nonhuman animal species identification and distribution, body-part count and distribution, and osteological indicators of butchery and consumption. The manifesto presents two cases studies from the Danish Mesolithic in order to delve into the sensorial, phenomenological potentialities of interspecies encounters as processual, material engagements shaped and constrained by the particularities of the beings involved.

However, the two Danish Mesolithic case studies use the durable remains of nonhuman animals to reconstruct human-swan relationships and other human-animal interactions; the human component of these material relationships is conspicuously absent. Many contexts where social zooarchaeological analysis is applicable do not contain human skeletal or material remains; yet one of the two Danish Mesolithic case studies is a mortuary context in which two humans (an adult woman and a newborn human) were interred along with nonhuman animals (Overton and Hamilakis, 2013: 132). The precise, nuanced investigation of the swan's material remains stands out in contrast to the relative lack of attention given the child and the absence of mention of the human woman. While Overton and Hamilakis marshal and implement a powerful conceptual apparatus for investigating human-animal relationships using established zooarchaeological methods, the elision of human material remains and the interpretation of the human role in interspecies entanglements presents a marked lacuna in the apparatus's interpretive potential. In other words, where are the humans in this vision of human-animal relationships?

To ask such a question of social zooarchaeology is somewhat unjust; to answer it requires transgressing its disciplinary boundaries into the realm of human bodies. However, a further form of theoretical connective tissue supports the integration of human and nonhuman bodily analyses: the shared materiality of humans and other animals. The visceral physicalities of humans and other animals is a form of materiality, which draws in key insights from materiality studies for a grounded, empirical, bodily examination of human-animal relationships or interspecies entanglements as material, bodily, imbricated interactions as ontogenetic processes. The next step is to extend the insights from multispecies ethnography and social zooarchaeology by incorporating the contributions of materiality studies to the realizations that objects and things exceed human intentionality, participate in social worlds, and mediate world-shaping relations in ethnographic and archaeological contexts.

6.6 Materiality Comes Alive

The agentive, sentient capacities of nonhuman animals receive scant attention in these theories of materiality, despite the long history of conceptualizing and treating nonhuman animals as objects (see previous section) and the inherent materiality of nonhuman animals. Whether objects act like humans or not, study of the social lives of objects reveal the material intersection of different scales of political practices. Objects are thus a productive analytic for examining how practices of production, consumption, and exchange are bound up in broader social relationships and institutions at local and imperial scales (Glatz, 2009; Halperin and Foais, 2010; Richard, 2010, 2019; Yao, 2012; Miller and Brosseder, 2013). Archaeologists in particular have explored how material qualities are key to the production of value (Richard, 2010), ideological discourse (Glatz, 2009), and social difference vis-à-vis politics (Bauer and Kosiba, 2016). Some archaeologists go so far as to argue that escalating human engagement with materiality and social evolution are a dialectical relationship (Renfrew, 2001; Hodder, 2014): as humans create more things, their dependence on those things increases, pushing the creation of an increasing preponderance of things and complexity of human-thing interdependence (entrapment: Hodder, 2014). Historical materialism has never been so concretely material as in this vision of human society and history.

Despite such research, archaeologies and anthropologies of materiality often struggle to consider nonhuman animals in their materiality or as meaningfully distinct from objects (but see Conneller, 2011; Chazin, 2016). Although the nature of the agency displayed by things or objects remains highly contested, it is clear that nonhuman animals are material, living beings that display unambiguous agency not reducible to human intentionality. Yet a focus on agency in the analysis of nonhuman animals risks falling into an anthropocentric model of action, engagement, and intentionality, akin to the pitfalls of anthropocentrism that plague ‘material turn’ theories of object agency. Multispecies ethnography offers a path out of this conundrum by setting aside questions of ontology (which in this case includes agency as a debatable component of the immanent nature of beings) in favor of an ontogenetic perspective on interspecies entanglements and how they generate social worlds.

An ontogenetic, relational framework will analyze human and nonhuman animal materials as produced by and productive of interspecies entanglements. Centering the shared materiality of human and nonhuman animals draws them out of ontological opposition and into a realm where through their qualities and interrelations they share efficacy or agentive properties (see Bennett's 'vibrant matter', 2010). Archaeologists in particular pushed the assemblage conceptualizations of human and nonhuman (animals, vegetation, stuff, and materials) entanglements out of horizontal constructions and into consideration of how those entanglements and the different material qualities involved generate historical logics (entrapment: Hodder, 2012) and political projects (entrainment: Bauer and Kosiba, 2016). Thus, new archaeological perspectives promise methodological approaches to the historical and political dimensions of these material entanglements: "*only* archaeologists have the tools to reveal how contextually specific entrained humans, materials, and things drove history and structured politics over long spans of time" (Bauer and Kosiba, 2016: 135). These powerful insights urge us to take seriously the materiality of humans *and* nonhuman animals in and of themselves but also in their messy, life-long relationships.

Key components of a methodology to examine living materiality in context already exist under the umbrella of archaeological inquiry. Where zooarchaeology deploys the methodological tools to examine nonhuman animal bodies as material manifestations of life events and relationships, bioarchaeology analogously examines human bodies. We might call zooarchaeology and bioarchaeology together methodologies of living materiality: empirical approaches to the material remains of once-living humans and other animals capable of examining complex intersections of social and biological. Above I argued that human-animal relationships play constitutive roles in the social worlds they inhabit, and that archaeological approaches promise insights into the complex temporalities and materialities of human-animal relationships not captured in ethnographic analysis. Here I argue that a particular perspective on the bodies of humans and nonhuman animals drawn from bioarchaeology will connect the theoretical arguments above to an analytic of living materiality.

6.7 Bringing Up The Bodies: Archaeologies of The Body and Bioarchaeology

> "Despite some concern that it has been difficult to locate and identify 'real people' and relate them to the archaeological record (Johnson 1989; Tringham 1991; Meskell 1998b), skeletons are such 'real people'. Indeed, identifying them as people and identifying with the past through them is perhaps the attraction of osteoarchaeology. There is nothing more real and concrete than human remains"
>
> -Joanna Sofaer, *The Body as Material Culture: A Theoretical Osteoarchaeology* (2006: 3)

The materiality of the human body as skeletal remains forms a productive analytic for bioarchaeologists and their engagement with broader anthropological discourses (Gowland and Knüsel, 2006; Sofaer, 2006; Borić and Robb, 2008). Bioarchaeology (sometimes osteoarchaeology) centers on the material remains of human skeletal systems – bones and teeth – found in archaeological contexts. Bioarchaeology may be viewed as the subdiscipline of archaeology entirely devoted to the physical, visceral, *actual* bodies and bodily parts of past human beings. Much of bioarchaeological research on the human body consists of osteological analysis rooted in methods drawn from biological scientific epistemologies; this comprises what

Joanna Sofaer identifies as a disciplinary divide in archaeological examination of the (human) body: science-based osteology and interpretive social theory, or a split between "osteoarchaeology and material culture-based archaeology" (2006: xiii). The interpretive side is represented by approaches within anthropology and allied disciplines that problematize the concept of a discrete, bounded, and natural human body. These social theoretical approaches investigate the ways in which it is partible (Strathern, 1988; Busby, 1997), citational (Butler, 1993), other/more than biological (Haraway, 1991), and social (Turner, 1980 [2012]). As Sofaer points out, these theoretically-innovative approaches to the human body generally elide the inherent biology and physicality of the body.

While the skeletal system is only one component of the body's materiality, it is particularly extensive, dynamic, and durable. As Sofaer argues, "the skeletal body is fundamentally material possessing its own material qualities. These qualities are related to the biological processes that form and renew the matter of which it is made. The materiality of specific bodies emerges from material qualities which permit or constrain their development… bodies are literally created through social practices" (Sofaer, 2006: xv). Sofaer's arguments lays the foundation for the concept of osteobiography (Saul and Saul, 1989), which characterizes the human skeleton as a palimpsest of "lifetime histories and biological events" (Hanks, 2008: 260). The skeletal materiality of the human body helps enact the social relations, biological processes, events, and practices that shape that materiality. Bioarchaeology has developed a suite of methodologies to examine and interpret that materiality. In this way, bioarchaeology and the human body roughly parallel zooarchaeology and nonhuman animal bodies.

The bones and teeth that develop, grow, and react during an individual's life remain long after death, collecting the events, relationships, and practices that brought the given body into being. Such an orientation towards the human skeleton is compatible with theorizations of the body as a congealment of practice, iteration, and citation, which is constantly coming-into-being (Butler, 1993). Rather than reifying an ontological distinction between the social and the natural, the Butlerian concept of the body shifts to an ontogenetic understanding of bodies that matter as the interplay of materials in a given context. As recent zooarchaeological scholarship extends the osteobiographical perspective to nonhuman animals (Orton, 2010; Conneller, 2011; Losey et al., 2011; Mlekuž, 2013; Overton and Hamilakis, 2013), expanding the framework to encompass living materiality (human and nonhuman animal bodies together) productive of and produced by their daily, life-long interactions as an osteobiographical account of human-animal relationships.

6.8 Relational Osteobiography

6.8.1 Expanding osteobiography

The concept of 'relational osteobiography' combines an argument from *multispecies ethnographies* with *archaeologies and anthropologies of the materiality of the body*. The former argues that humans and other animals engage and are engaged in myriad multifaceted relationships that constitute and are constituted by social worlds. The latter holds that materiality is relational in the specific forms that it takes in particular historical contexts and manifests as socially-intelligible bodies[52]. Relational osteobiographies would articulate humans and other animals as emerging through complex material interactions throughout their lifetimes. Human

[52]For a detailed discussion of the life-historical specificity needed to analyze animal materials that emerge through human-animal interaction, see Conneller, 2011)

and other animal bodies take shape through their material interrelations because their bodies are plastic and reactive in the course of ontogenetic development.

I propose an expansion of the concept of an osteobiography in order to reckon with the congealment of relationships and interactions between humans and other animals over the life course in a given social world or natureculture. The traditional osteobiographical approach analyzes a social being as the compilation of its past events and activities (see Saul and Saul, 1989; Robb, 2002; Boutin, 2012; Agarwal, 2016). A *relational osteobiographical* approach would characterize those past events and activities as aspects of relationships between social beings: human and animal remains in context are primary evidence of those relationships. My proposed expansion of osteobiography contains parallels with two recent works by Lauren Hosek (2019) and Sarah Baires (2016) that develop and deploy novel iterations of the foundational concept. Hosek formed the concept of *microhistorical osteobiography* as a relational, multiscalar method for analyzing an individual human "body as a node conjoining overlapping temporalities, materials, and biographies" where "[t]he lived experience of an individual is thereby combined with other emergent scales as people interact with their social and physical environments" (2019: 47). Hosek argues that her microhistorical osteobiography represents a method to locate and untangle the ways in which societal processes were enacted and made material in once-living bodies, particularly "to reveal previously overlooked or concealed aspects of broader structures" (ibid: 47). Her version of osteobiography offers a challenge to the assumption that individuals and their bodies – the skeletal remains that bioarchaeologists construct into an individual human – are methodologically and analytically remote from broader scales of historical transformation.

Hosek's articulation of osteobiography harmonizes with Sarah Baires' microhistorical approach to more-than-human mortuary practices at Cahokia in the disarticulated bodies of humans and gastropods interred together (2016). Where Hosek confines her concept of osteobiography to the human body, Baires expand osteobiography to account for the other-than-human bodies that constitute the social worlds within which past humans dwelt (2016). She conducts a fine-grained analysis of "the production and experience of lived bodies" (2016: 2) based on the argument that "bodies are embedded in movements engaged in multiple relationships extending beyond the human and the living world" (ibid). Baires reveals how earlier-period Cahokians removed human flesh from bone in parallel with pulling gastropod flesh from shell before interring both kinds of durable bodily remains together in ridge-top burial mounds. In Baires' analysis, the deliberate association of defleshed gastropods and humans in mortuary space suggests complex, bodily relationships of mediation and entanglement of 1050-1200 AD Cahokia .

While Hosek's *osteobiography* is avowedly relational and multiscalar, her application of the concept is confined to close osteological analysis of human bodies (2019). Baires' osteobiographical approach incorporates human and nonhuman (gastropod) bodies, focusing on relationships between the living humans who disarticulated deceased beings and those deceased beings (human and gastropod). While Baires' application of osteobiography to the nonhuman and to relationships between humans and other beings opens exciting interpretive terrain for inquiry into the past constitution of more-than-human worlds, it elided lived experiences as relationships between humans and gastropods at Cahokia manifest in their durable remains (2016). *Relational osteobiography* thus builds on Baires' precedent by incorporating the material interactions between humans and other animals during their lifetimes into analysis of those relationships after all or most of those social being have died. *Relational osteobiography* includes the relational approach to a once-living body as a locus where multiple scales of sociopolitical processes intersect in Hosek's work and the more-than-human relational constitution of social reproduction in Baires' (2016).

In this project, relational osteobiography takes osteobiography from a focus on the life-history of a social being to an examination of the complex relationships between social beings that constitute a given natureculture. Put another way, humans and other animals constituted a past social world through their relationships, which occur at various scales, and these relationships shaped and were shaped by the participating material bodies. The remains of these material bodies – human and nonhuman animal – contain osteological, spatial, and taphonomic information about those relationships. *Relational osteobiography* as an analytical framework is heavily informed by recent bioarchaeological and zooarchaeological uses of microhistory (cf. Ginzburg, 1980) in archaeological interpretation (Baires, 2016; Hosek, 2019). Hosek argues that "microhistorical osteobiography offers a bottom- up view of these histories and their complex intersections in daily life. The narratives that emerge, of clues and signs at once biological and social, enrich our understanding of the past beyond the traces of individual lives" (2019: 54).

A relational osteobiographical approach or framework operationalizes the key contribution of living materiality: that the relationships between humans and other animals that constituted and are constituted by social worlds are inherently material. In order to operationalize this insight, a relational osteobiographical approach should be applied to an empirical context where physical embodiments of living materiality (human and other animal durable remains) are found in spatial and temporal association. A relational osteobiographical approach captures the analytical power of assemblage as deployed in recent archaeological investigations that fall under the umbrella of materiality studies to reveal the politics of contingent, open-ended associations of humans and their co-conspirators in social worlds. A relational osteobiography is an approach to a mortuary context, where the associations of embodiments of living materiality (human and other animal remains) were intentional. Furthermore, when human and nonhuman animal remains are found in the mortuary contexts of mobile pastoral societies, where humans and other animals (especially domesticated herd animals) lead close, complex, and deeply interdependent lives, a relational osteobiography further contains a level of information about the practices and ideologies of those peoples regarding the 'right ordering' of living materiality (i.e., the human-nonhuman animal relationships that form the core of their social world).

6.8.2 Relational osteobiography as assemblage and assembling

A relational osteobiography is an assemblage. Relational osteobiography as assemblage is the intentional association of human and nonhuman animal material remains within a discrete context. The concept of the assemblage, which has a long and pervasive history in archaeological inquiry, acquired new analytical potential in recent years due to the ways in which the concept "promotes a dismantling of notions of *systemic determination* and *human agency*" (italics original: Richard, 2019: 3). Following this vein of thought, the assemblage accords with the theoretical underpinnings of living materiality as a concept drawn out of ontology-disrupting work across multispecies ethnography and materiality studies. As an analytic, the assemblage reconfigures the flow of agency beyond human hands to unveil how "materialities influence the field of human happenings in ways that sometimes exceed people's doings" (Richard, 2019: 3). Moreover, assemblages are the open-ended, contingent, and relational gatherings and constellations that comprise social worlds and multispecies world-building projects (Tsing, 2015). Within the conceptual framework of living materiality, the assemblage's imbrications with the fleshy, visceral, troubling and troublesome kinship of companion species reinforces the primacy of ontogenetic mutual becomings over ontological differentiation (Haraway, 2016).

As an assemblage, relational osteobiography thus rejects any attempt at totality or close-endedness in its analytical potential. Relational osteobiography works when the analyst selects a particular component of or thread that weaves through the assemblage. Living materiality itself is one massive, unwieldy constellation; from another perspective, it contains a multitude of assemblages. In this project relational osteobiography and living materiality target interspecies entanglements specifically manifested in the relationships between humans and domesticated herd animals in life and on into death in a specific setting comprised of a finite number of discrete contexts (tombs). Undoubtedly many other materials, objects, agents, and landscapes play significant roles in these relationships and constitute critical assemblages. However, this project asserts that human-animal relationships, as material interactions that constitute and are constituted by social worlds, are a uniquely productive lens through which to assemble a contingent, contextual assemblage. The promise of living materiality is the shared materiality, plasticity, and responsiveness of human and nonhuman animal physicality (bodies), which is crystallized through relational osteobiography into empirical cases amenable to analysis. To consider materials and agents beyond living materiality would be a worthy but distinctly different project.

Relational osteobiography is also an act of assembling as reassembly. By operationalizing the concept of living materiality reassembles, it reassembles some of the archaeological context – the materials assembled in time and space – that archaeological knowledge production disassembles. To wit, *relational osteobiography* reconstitutes the interspecies assemblage that the standard archaeological research processes of separating human from nonhuman animal remains for separate bioarchaeological and zooarchaeological analysis, respectively, disarticulates.

6.8.3 Towards an application of relational osteobiography

Relational osteobiographies compile information – body part distribution, fragmentation, and pathologies related to work-load, trauma, and health (disease, quality of diet) correlated to age, sex, and species – that identify the activities and practices of humans and other animals in daily life and over a lifetime. These activities are conceptualized as interrelated because they occur through human-animal relationships over each individual's lifetime (such as riding, veterinary care, and dental health in a dairy- and meat-focused economy) and because biological and social qualities shared by humans and other animals condition those relationships. The methodological tools already exist to examine human and animal bodies as the vehicles and sites of their interrelations that shape those bodies and the social world that they share because bioarchaeology and zooarchaeology have rigorously developed the analytical and theoretical frameworks to generate osteobiographies. The living materiality perspective on to human-animal relationships deploys the relational model of materiality over lifetimes (and even generations), which means that biological and social events and processes at disparate temporal scales are captured in the bone, teeth, and other durable matter of humans and animal. The subsequent data section of the dissertation will elaborate upon the axes of relational osteobiography.

Richness, potentiality, and contingency in a given social field are vivid in human-animal relationships: within these interactions, agency is not unidirectional, the common physicality of humans and animals provides a commensurable medium and measure of their impacts on one another. These interrelationships mutually constitute the agentive and physical attributes of the participants (Callon, 1986; Vitebsky, 2005; Kohn, 2007). Relationships between human and nonhuman animals are critical to the constitution of social and political life because of the dynamic and open-ended nature of the engagement. This generative power of human-animal relationships in their given social world potentially acts as another locus for social and political production, wherein the constitutive, processual, and imbricated nature of those engagements is capitalized upon for ideological purposes.

Relational osteobiographies manifest most accessibly in mortuary contexts, which are created through practices that identify, manipulate, and arrange materials from the mundane sphere into places imbued with tremendous ideological and symbolic significance (Trinkaus, 1984). When mortuary practice associates human and other animal bodies, the durable matter – bones, teeth, shell, and sometimes horn, hooves, claws, keratin carapace, hair, and even flesh – of those bodies remain as embodiments of the daily, lifelong material interactions. A relational osteobiographical approach to those once-living materials analyzes them as produced through the human-animal relationships at the core of the past social world along the axes of material interaction, temporalities of human-animal relationships, spatial patterning, and ideologies. A relational osteobiographical analysis of human and other animal bodies' durable matter associated in mortuary space is particularly well-suited to interrogating the significant otherness of those human-animal relationships in the ideological, symbolic, and political milieu of the past social world. Mortuary practice that intentionally associates human and other animal bodies selects those bodies for the significance of their qualities, which generates another layer of information about the social world as a result. The matter that matters to a past social world stands out in mortuary space when understood as qualities within relational osteobiographies. The significant otherness of companion species manifest in the ambivalent affective ties in mobile pastoral human-animal relationships during life may serve as another locus for ideological work in mortuary practice.

6.9 Conclusion

Relational osteobiographies result from and index shared material and temporal qualities across human and nonhuman bodies in a given natureculture. The relational osteobiographical framework promises to help interpret how and why once-living materials came to matter in a past natureculture through the concept of living materiality. By unsettling ontological distinctions and foregrounding ontogenetic configurations, living materiality opens analytical space for examining the multitudinous, complex intersections of temporal and bodily materialities generated by human-animal relationships.

The relational osteobiographical approach to human-animal relationships deploys the relational model of materiality over lifetimes (and even generations), which means that biological and social events and processes at disparate temporal scales are captured in the bone, teeth, and other durable matter of humans and animal. Each relational osteobiographical unit – assemblage of intentionally-associated human and nonhuman bodies – embodies material bodily interactions, complex temporalities, and spatial patterning of human-animal relationships as they were. The intentional 'doings' that assembled each relational osteobiographical unit in mortuary space work with specific instantiations of living materiality to codify and contest the 'right' order of the cosmos. Relational osteobiographies thus manifest ideological concerns and contextual politics within a given natureculture.

The concept of living materiality aims to be flexible enough to capture the open-endedness of human-animal relationships yet capacious enough to examine how matter and materiality co-constitute historical, ideological, and political dimensions of a given social world. The contributions of multispecies ethnography, the ontological turn, materiality studies, and social zooarchaeology indicate that it is more analytically useful to set aside a focus on categorical differences between humans and other animals, and to focus upon their interrelationships in anthropological analyses of shared social worlds. Incorporating a material, processual orientation towards those relationships drawn from zooarchaeological and bioarchaeological methods and anthropologies of the body generates the relational osteobiographical framework for examining the bodily material, temporal, and spatial dimensions of human-animal relationships. A relational osteobiographical approach to the social worlds that anthropologists aim to understand promises to integrate productive-yet-disparate lines of inquiry into an analytic (living materiality) linked to a clear methodological framework (relational osteobiography).

A relational osteobiographical approach to human-animal relationships would find fruitful application in naturecultures where humans and other animals live closely entangled, interdependent lives and are consistently associated in death. A mobile pastoral society, which depends upon and arises from the daily, lifelong, and complex material interactions between humans and other animals, fits this description aptly. The Xiongnu Empire of the late Iron Age Mongolian Plateau present an empirical case where mobile pastoralism shaped daily life, political economy, and social organization; critically, material remains of humans and other animals are consistently associated in Xiongnu mortuary contexts.

CHAPTER 7

BRIDGING SECTION: SOCIAL BODIES REVISITED

7.1 Introducing Relational Osteobiographies at Elst Ar

This chapter prefaces the *relational osteobiographical analyses* of the interspecies assemblages excavated from eight Xiongnu tombs from the Elst Ar cemetery in Central Mongolia. The utility and potential of *relational osteobiographical analysis* at Elst Ar rest on the integration of four arguments laid out in previous chapters: 1) human-animal relationships, or interspecies entanglements, are mediated materially through the bodies of the human and nonhuman animals involved; 2) those entanglements co-constitute the social worlds which anthropologists and archaeologists aim to understand; 3) in mobile pastoral contexts, those entanglements are particularly close, complex, and interdependent; and 4) the Xiongnu at Elst Ar and across their imperial sphere of influence consistently and intentionally associated humans and nonhuman animals (especially domesticated herd animals, or the five muzzled beasts) in mortuary ritual and space.

Resultant *relational osteobiographies* convey plausible, empirically grounded accounts of the fundamental components of Xiongnu society made intelligible through the evidence of their material entanglements literally manifest in their bones: herders and herd animals. In life and in death, through lived experience and constructed relationships in mortuary ritual, herders and herd animals were always together. Each *relational osteobiography* presents the unique lives and deaths that went into the making of a Xiongnu interspecies assemblage, lending full weight to the particular, the specific, and the unique nature of each tomb and the living materiality it contains.

7.2 The Xiongnu Cemetery at Elst Ar

The Xiongnu imperial cemetery at Elst Ar consists of 26 mortuary contexts[53] located Bulgan *aimag* at N48˚07'26.0" E104˚17'24.7" (48.123889, 104.290194), roughly 40 km north by northeast of the county seat of Dashinchilen *sum* in Dorgont *bag* (Erdenebold et al., n.d.a., b.). These contexts at Elst Ar cluster on the northeast slope of the Dorgonotyn Hills between the Khar Bukh and Zaamar rivers in the western aspect of Tuul River drainage basin of Central Mongolia (Erdenebold et al., n.d.b: 7). The Xiongnu cemetery at Elst Ar sits in very close proximity to a Bronze Age site – Mösöngiin Khürem – such that archaeologists excavated at the two sites simultaneously during the 2011 field season (Erdenebold et al., n.d.a).

Figure 7.1 Photograph of 2012 excavations by SHUTIS/MUST archaeologists at the Elst Ar site in Dashinchilen *sum*, Bulgan *aimag* (image courtesy of Erdenebold et al., n.d.a)

[53]The 2011 and 2012 field reports on excavations at Elst Ar report 25 and 26 mortuary surface features, respectively (Erdenebold et al., n.d.a,b). However, maps provided in both reports show only 23 mortuary surface features comprising the Xiongnu cemetery at Elst Ar.

The Elst Ar cemetery contains only ring burials (Erdenebold et al., n.d.a), meaning that the tombs' surface features and internal construction conform to one of the two general types of Xiongnu 'elite' mortuary contexts distributed across Mongolia and southern Siberia (Chapters 3 and 4; Honeychurch, 2015; but see Törbat, 2004). Other ring-only Xiongnu cemeteries have been documented and investigated in the Tuul River drainage basin, including several famous sites excavated by previous Mongolian and international archaeological expeditions in earlier decades: Zaraa Tolgoi in Büregkhangai *sum*, Bulgan *aimag*; Morin Tolgoi in Altanbulag *sum*, Töv *aimag*; Altantsetseg Uul in Altanbulag *sum*, Töv *aimag*; and Baruunkhairkhan in Altanbulag *sum*, Töv *aimag* (Erdenebold et al., n.d.b; Törbat, 2004; Regzen and Batbold, 2007). Elst Ar is one example of a ring-only Xiongnu cemetery identified in the Tuul River drainage basin more recently; another example is Ulaan Shiver, located northeast of Elst Ar across the Tuul River in Zaamar *sum*, Tov *aimag* (Erdenebold et al., n.d.c).

Elst Ar sits off a wide, plain-like natural corridor from the Tuul River to its east to the Orkhon River to its west through which one of Mongolia's few paved long-distance highways (the Millennium Road) runs from Ulaanbaatar to the eastern bank of the Orkhon River. The location of medieval fortress and settlement sites – including Khar Bukhyn Balgas, Chin Tolgoi, Kheremiin Denj, Ulaan Kherem, and the ruins of the Tsogt Taij palace (Erdenebold et al., n.d.b,c) – within this natural corridor attest to the long-term significance of this east-west plain as an archaeological landscape.

The rationale for conducting this project on the human and nonhuman animal assemblages from Elst Ar was largely practical. Not long after fieldwork plans for excavation of another Xiongnu cemetery fell through, I was given a chance to work with already-excavated bodily remains in need of bioarchaeological and zooarchaeological analyses. These comprised the Elst Ar Xiongnu assemblages. In addition to the practical, Elst Ar provided an opportunity to investigate the multispecies entanglements of “ordinary” Xiongnu buried in ring tombs, rather than the upper echelons of imperial society interred in the monumental platform tombs. Moreover, I was able to analyze human and nonhuman animal remains from eight out of 26 excavated Xiongnu tombs, or nearly one-third of the total possible count of multispecies mortuary assemblages at Elst Ar. While not generating statistical significance, such a sample size in proportion to the whole site makes it possible to gain a more complete picture of the mortuary practices at Elst Ar than when working with assemblages from a much larger Xiongnu cemetery (such as Tamiryn Ulaan Khoshuu).

Archaeologists from the Mongolian University of Science & Technology excavated 14 Xiongnu tombs across the 2011 and 2012 field seasons at the Elst Ar cemetery (Erdenebold et al., n.d.a,b). Most of the human and nonhuman animal remains from these 14 Xiongnu tombs were transported to Ulaanbaatar and stored in the ATRC collections facility, of which I was able to analyze eight.

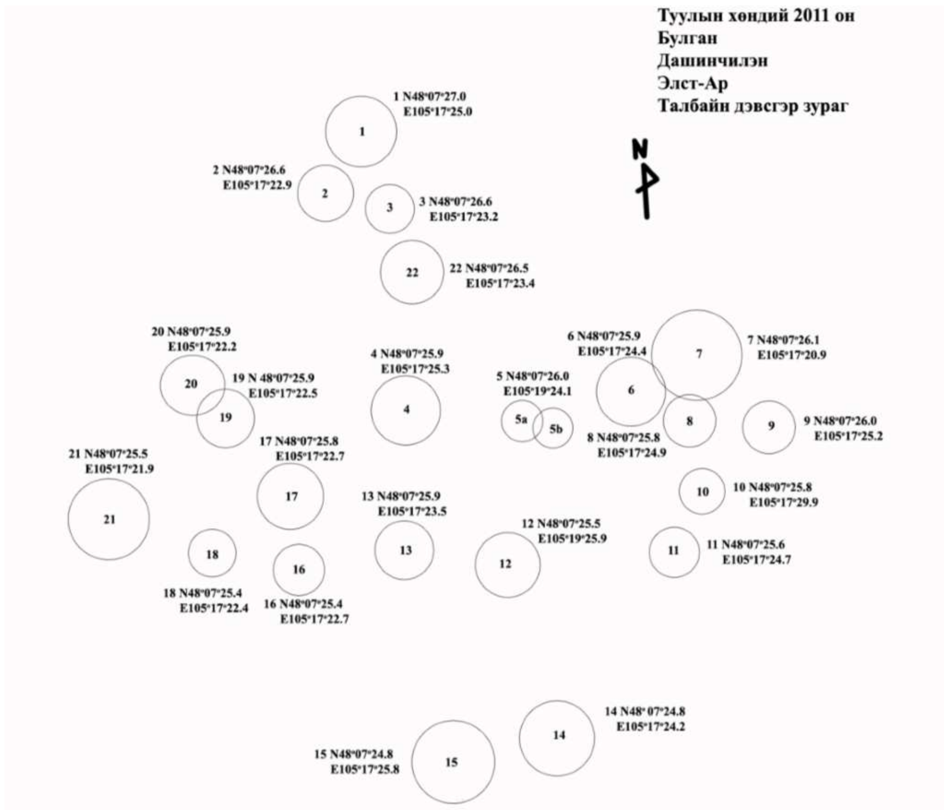

Figure 7.2 Plan of the Xiongnu cemetery at Elst Ar. I analyzed the complete zooarchaeological and bioarchaeological assemblages from tombs 1 (Grave 001), 4 (Grave 004), 12 (Grave 012), 13 (Grave 013), 15 (Grave 015), 20 (Grave 020), 21 (Grave 021), and 22 (Grave 022; image courtesy of Erdenebold et al., n.d.a).

Like other Xiongnu mortuary contexts across Mongolia, southern Siberia, and Inner Mongolia, the ring tombs at Elst Ar contained human and nonhuman animal remains: horses, sheep (and possible goats), cattle, and humans. The interspecies assemblages embody the core components of an Inner Asian mobile pastoral context: human herders and four of the five herd animal taxa comprising the five muzzled beasts. The Xiongnu who conducted the mortuary rituals and constructed each mortuary space at Elst Ar intentionally assembled these human and nonhuman animals together. The tremendous ideological, political, and cosmological significance of mortuary space necessitates that these assembling practices *and what they assembled* were imbricated in that multivalent significance. If it was significant to those who enacted mortuary ritual that these specific human and nonhuman animals be assembled *together* in the creation of mortuary space, then the specific and material qualities (including species, age, sex/gender, body-part, state of health, and so forth) of those human and nonhuman animals hold massive interpretive potential for archaeological analysis.

7.3 From Osteobiography to Relationships

7.3.1 Traditional osteobiography

The above-mentioned material, bodily qualities are the focus of traditional osteobiographical analysis. Traditional osteobiography focuses on an individual through their skeletal remains to generate an account of biosocial life events and processes that occur in a specific cultural (archaeological) context. Traditional osteobiographical analysis carries a long history in archaeological and anthropological knowledge production. In 1961, F.P. Saul coined the terms *osteobiography* and *osteobiographic analysis* in order to "emphasize that skeletons record the life history of their occupants in various ways and that we should be extracting these life histories from their bones" (Saul and Saul, 1989: 288). *Osteobiographical analysis* began with humans, where Saul explicitly drew on the medical and human biological research undertaken by his mentors that married their academic knowledge of a past society (ancient Greece) and medical/anatomical training to reconstruct an individual's lifestyle from their osteological remains (see Saul and Saul, 1989). *Osteobiography* relies on the dynamic qualities of the skeletal system as a key mediator of human activity and as materially-reactive to internal ontogenetic processes and external stimuli. Bioarchaeologists enhance this understanding by embedding the human skeleton in a social context, which renders the skeleton's materiality jointly and inextricably biological and social (Sofaer, 2006).

In recent decades *osteobiography* has emerged as a powerful interpretive method for bioarchaeological and zooarchaeological approaches to individual life-histories within the archaeological record (Saul and Saul, 1989; Robb, 2002; Losey et al., 2011; Boutin, 2012, 2016; Chazin, 2016). Osteobiographical analysis lends itself to detailed accounts of embodied experience at the scale of an individual yet capable of scaling to broader group dynamics and processes along linkages between bodily practices and wider cultural phenomena (Robb, 2002; Boutin, 2012; Gifford-Gonzalez, 2018). Bioarchaeologists who deploy traditional osteobiographical analysis use information and theories about an archaeological milieu to contextualize and enrich an individual life-history written in bones and teeth (Hawkey, 1998; Marshall, 2014; Willman et al., 2020). Archaeologists have even conducted biographical analysis on objects (Kopytoff, 1986; Gosden and Marshall, 1999), a testament to the method's productivity in anthropological knowledge production.

Zooarchaeological analysis primarily aggregates datasets that represent population-level interpretation of nonhuman animals in archaeological contexts generated over time through various behaviors, processes, and activities (see Chazin, 2016). Many zooarchaeological methods and analytical units necessitate large sample sizes from which to derive patterns that can be marshaled to address broader archaeological concerns with political economy, subsistence patterns, environmental reconstruction, and so forth. Traditional osteobiography operates at the level of individual humans (Saul and Saul, 1989; Robb, 2002; Boutin, 2012; Agarwal, 2016; Hosek, 2019; Robb et al., 2019) and nonhuman animals (Chazin, 2016) but also interprets the relationship between the individual and a larger population in a broader cultural context (Robb, 2019).

7.3.2 The relational in life and in death

The material qualities of the specific human and nonhuman animals comprising an interspecies assemblage can illuminate both the lived experiences of those human and nonhuman animals and how those embodied experiences were significant to those who assembled them in mortuary practice. From a *relational osteobiographical perspective*, these material qualities emerged from complex, close, and life-long interspecies entanglements, which are intensified in Inner Asian mobile pastoral contexts; in turn, those material qualities shaped ongoing interspecies entanglements. The relational nature of living materiality surfaces again: how an old man interacts with a flock of wethers[54] in autumn is quite different than how a young woman interacts with a herd of mares and nursing foals in early summer. Those who enacted the mortuary rituals that assembled the specific human and nonhuman animals comprising each interspecies assemblage worked with and through the particularities of that living materiality.

The interspecies assemblage as a manifestation of living materiality, a constellation of specific human and nonhuman animals placed in intentional association, results from the paramount emphasis that mortuary practitioners at Elst Ar placed on the relationships between human and nonhuman animals. Those relationships were inextricably bound up in the specific material qualities of those particular human and nonhuman animals: species, age at death, sex/gender, state of health, and many more material bodily qualities. In life, said material

[54]A wether is a castrated male sheep.

qualities played constitutive roles in the daily, seasonal, and life-long activities of a mobile pastoral society. In death, those engaged in mortuary ritual would be aware of these qualities and deploy, harness, or obfuscate them in the 'doings'[55] (Fowles, 2015) or specific constructions of relationships key to the discourse of power enacted in mortuary ritual (Fowles, 2015). Therefore, interspecies assemblages in mortuary space contain disjunctures between *lives as they were actually lived* and *relationships as they were constructed in mortuary practice*.

Integrating bioarchaeological and zooarchaeological data enables an empirically-grounded analysis of each intentional interspecies assemblage that interprets *the lived experiences of its component beings* and *the construction of their association in death through Xiongnu mortuary ritual at Elst Ar.* First, as discussed above, the bodily record of lived experiences understood as life-long, complex interactions between those humans and other animals. Second, that bodily record – the teeth, bones, and other durable biological matter of human and nonhuman animals in each mortuary context – was deployed by those whose mortuary practices assembled the grave in question. Mortuary practice is not random or happenstance; the rituals, beliefs, and activities that animate mortuary practice are deeply and explicitly ideological. The humans and domesticated herd animals assembled together in Xiongnu mortuary spaces embody intentional, ideologically motivated practices. Those responsible for the Xiongnu cemetery at Elst Ar worked with and through the bones, teeth, and other biological matter of humans and other animals in their mortuary practice.

[55] "Doings – in contrast to the classic functionalist understandings of tribal ritual – do not necessarily integrate society. As I have emphasized, they are instead a kind of exegesis on worldly interconnection in which claims are made about the order of things, claims that may sometimes be designed to end quarrels but that are nevertheless always open to dispute, rejection, or revision. Doings, in other words, are explicit efforts to both mirror and assert structure, but they themselves are not structure. They are, more accurately, a discourse *about* structure, which is why they are also a discourse of *power*" (Fowles, 2015: 151).

This entire interspecies assemblage scale of relational osteobiography deals in two distinct phenomena at play in a mortuary context where humans and other animals have been found: the lived experiences manifest in the bones, teeth, and other durable matter constituting the interspecies assemblage, and the intentional nature of their association. Those who assembled each constellation of human and nonhuman animals in the Xiongnu graves at Elst Ar intended them to be associated in mortuary space. We can hypothesize that the specificities of those herders and herd animals – including their material particularities manifest as age, sex/gender, lived experiences, and more – mattered to those assemblers. Moreover, those specificities were made to matter when placed in association or relation with one another; when intentionally gathered into an assemblage.

7.4 Analyzing The Elst Ar Assemblages

The eight relational osteobiographical accounts of Xiongnu multispecies mortuary assemblages at Elst Ar in Chapter 8 represent plausible, productive interpretations of the *living materiality* assembled together during mortuary ritual. Each tomb manifests a discrete, particular assemblage of human and nonhuman animals (now in parts, whatever state they went into the grave in) that is one component selected from a complex palimpsest of intentional activities and taphonomic processes working on a larger mortuary assemblage including a variety of grave goods and tomb construction materials fashioned from organic and inorganic materials.

To investigate the specific material qualities of each interspecies assemblage, I deployed standard bioarchaeological and zooarchaeological methods[56] to analyze the human and nonhuman animal osteological materials from each of the eight mortuary contexts. I conducted bioarchaeological and zooarchaeological analyses of the Elst Ar assemblages housed in the collections of the Ancient Technologies Research Center at the Mongolian University of Science and Technology between January 2014 and June 2016.

I analyzed these human and nonhuman animal osteological remains for taxon, element and element completeness, skeletal sex, age at death, postmortem treatment (including evidence for burning and butchery), paleopathological indicators (including histological reaction denoting generalized infection, healed and perimortem physical trauma, degenerative joint disease, dental caries, and antemortem tooth loss), and musculoskeletal stress markers (i.e., state of muscle attachment sites in the postcranial skeleton indicating heavy, consistent biomechanical workload) when possible (see Appendix D). I was assisted in some of my bioarchaeological and zooarchaeological analyses by my primary collaborator, National University of Mongolia (NUM/MUIS) doctoral candidate and Mongolian University of Science and Technology (MUST/SHUTIS) lecturer Chuluunkhüügiin Vanchigdash.

Ch. Vanchigdash was instrumental to this project's success in myriad ways, including: securing permission to work with the human and nonhuman animal remains recovered during the 2011 and 2012 MUST field seasons at Elst Ar; access to the MUST lab facilities and collections; procuring a comparative collection of individual domesticated herd animals (*Ovis aries*, *Capra hircus*, *Equus caballus*, *Bos taurus*) for use in zooarchaeological analyses; liaising with other

[56]See Appendix D for a detailed discussion of the specific methodologies employed in this project's relational osteobiographical analyses of human and nonhuman animal osteological materials from the Xiongnu cemetery at Elst Ar.

Mongolian archaeologists, scholars, and administrators at MUST and NUM; and assisting in securing official permissions, academic research visa (2015-2016), foreign resident registration, and numerous related tasks. Without the collaboration of Mr. Vanchigdash, this project could never have been undertaken. I was also assisted during the first half of 2015 by four advanced undergraduate students from the National University of Mongolia (NUM/MUIS), who helped me record and store many human remains from Elst Ar as part of my primary bioarchaeological data collection reorganized as a bioarchaeological lab practicum.

My bioarchaeological and zooarchaeological analyses indicate who – human and nonhuman – comprised the intentional interspecies assemblage in each of the eight Xiongnu tombs at Elst Ar. Assessments of skeletal sex and age-at-death estimates for human and nonhuman animal osteological materials, when enabled by empirical osteobiographical data, refine the picture of who comprised a given interspecies assemblage.

Numerous human and nonhuman animal osteological materials from Elst Ar display paleopathological indicators, including: dental caries and abscess; occlusal wear; accumulation of dental calculus; antemortem tooth loss (and alveolar resorption); multiple stages of degenerative joint disease (DJD); histological reaction of cortical surface (consistent with nonspecific infection of bony tissue); healed and healing fractures; false joints; nonmetric traits; and unusual morphologies potentially indicative of heavy load bearing over long periods of time, intentional bodily modification, or other artificial manipulation of osteological development[57]. The phenomena are particularly marked events, relationships, and practices accumulated in the embodiments of Elst Ar's living materiality.

[57] See Appendices D and E-L further details of these phenomena.

Some osteological materials bear stains consistent with close proximity to various metals (notably copper and iron); a select few have bits of faded red cloth clinging to them. Some nonhuman animal remains bear traces of burning, perforation, and cutmarks. No complete human or nonhuman animal skeletons were recovered from the eight Xiongnu tombs excavated at Elst Ar. Contextual information does not allow reconstruction of individual nonhuman animal bodies placed in these graves[58]. Postdepositional disturbance means that it is possible that more human and nonhuman individuals were originally interred in each context than the subsequent *relational osteobiographical analyses* present. Most Xiongnu mortuary contexts excavated in Mongolia show evidence of re-opening, often classified as looting and robbing by archaeologists. However, in her comparative analysis of Xiongnu monumental terrace tombs, Ursula Brosseder (2009) argues archaeologists are assuming the intentions of past peoples who re-opened Xiongnu mortuary contexts, suggesting that 're-opening' presents a less-laden term to describe these widespread practices. In her systematic analysis of monumental Xiongnu terrace tombs from Mongolia and southern Siberia, Brosseder (2009) found that tomb reopening alone does not account for the differences between mortuary assemblages recovered from monumental terrace tombs, extending to the overlap between the assemblages of small square/terrace tombs and

[58] All contextual information about the Elst Ar site and the production of the relational osteobiographical dataset from excavations therein derives from two unpublished Mongolian-language field reports on field projects conducted in 2011 and 2012 by expeditions from the Mongolian University of Science and Technology (MUST) (Erdenebold et al., n.d.a., n.d.b.). In the subsequent chapters presenting each relational osteobiography, results of bioarchaeological or zooarchaeological analysis of the eight Elst Ar mortuary contexts sometimes conflict with information in the 2012 and 2013 Elst Ar field reports; those discrepancies are noted and discussed therein. As I translated the Mongolian-language field reports, I acknowledge that some discrepancies may arise from my own translation errors. Detailed contextual information that located all components of each mortuary assemblage in three-dimensional space would be ideal for *relational osteobiographical analysis*. However, as this is not possible for Elst Ar and is rarely possible for previously-excavated materials (particularly in Mongolia), relational osteobiographies herein will consider the specific spatial associations constructed through mortuary practice in each tomb as documented in the field reports with due caution.

circular tombs, in accord with earlier research by Russian archaeologist Sergei Minyaev (or Miniaev, 1985).

All eight graves excavated by archaeologists in 2011 and 2012 at Elst Ar display evidence of having been re-opened at least once after the initial mortuary ritual created this mortuary space (Erdenebold et al., n.d.a.,b.). Said re-opening activities disturbed the original spatial arrangement of the interspecies assemblages created by the original assemblers (ibid). It is highly likely that the re-openings and disturbance of these contexts included the removal of human and nonhuman animal remains along with other components of the mortuary assemblage. It is also possible that components of the mortuary assemblage, including portions of the interspecies assemblage, were placed in each grave during subsequent reopenings of the grave. Thus, the count of skeletal elements and body parts comprising the interspecies assemblage in each of the eight graves at Elst Ar should not be held to fully reflect the precise proportions of human and nonhuman animals assembled during the original Xiongnu mortuary ritual. As a result, counts of skeletal elements and fragments, and analyses of body-part distribution by taxon and body-size class do not figure in the following *relational osteobiographical* accounts of the Xiongnu graves at Elst Ar.

The following chapter presents each of the eight mortuary contexts excavated by archaeologists from the Mongolian University of Science and Technology in 2011 and 2012 as a discrete, intentional unit of significance for the Xiongnu of Elst Ar that operated with living materiality most productively understood from a relational osteobiographical perspective. As discussed in the previous chapter on theoretical concerns, a relational osteobiography comprises a particular assemblage along the logics of living materiality; it does not claim a comprehensive or totalizing account of the entire mortuary context or unit of significance.

At Elst Ar, the Xiongnu interred horses (*Equus* sp.), cattle (*Bos* sp.), and sheep and possibly goats (*Ovis aries* combined with *Ovis/Capra*) together with humans. Only two contexts (Graves 001 and 022) include representatives from all four of the five muzzled beasts taxa represented at Elst Ar[59]. Osteological remains of at least one human were found in each of the eight mortuary contexts; at least two humans were interred in half of these (Graves 012, 020, 021, and 022). No complete human or nonhuman animal skeletons were recovered from the eight Xiongnu mortuary contexts at Elst Ar analyzed in this project.

All eight of the Xiongnu tombs at Elst Ar were re-opened at least once after the initial mortuary ritual created this mortuary space, which disturbed the original spatial arrangement of the interspecies assemblage created by the original assemblers. It is highly likely that these re-openings and disturbances included the removal of human and nonhuman animal remains, given that no complete skeletons for either human or nonhuman animals were retrieved from these eight tombs. The disturbances of these eight tombs may have involved later additions to the interspecies assemblages therein; it is impossible to rule out the possibility that components of the mortuary assemblage in each tomb, including portions of the interspecies assemblage, were placed there during subsequent reopenings of the grave. Thus, the count of skeletal elements and body parts comprising the interspecies assemblage in each of these eight tombs should not be held to faithfully reflect the original mortuary ritual as enacted by the Xiongnu assemblers of Elst Ar. Counts of skeletal elements and fragments, and analyses of body-part distribution by taxon and body-size class do not figure significantly in the following *relational osteobiographical* accounts of the Xiongnu community at Elst Ar.

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[59]See Appendix D

Because of the likely taphonomic impacts that reopenings have on the Xiongnu mortuary contexts at Elst Ar, the subsequent *relational osteobiographical analyses* remain ambivalent about NISP (Number of Identified Specimens: Lyman, 1994), body-part distribution, and other zooarchaeological units of analysis that would be productive aspects of *relational osteobiographical analysis* in a different archaeological context. Therefore, the *relational osteobiographical accounts* of the interspecies assemblage in each Xiongnu tomb at Elst Ar focus on the minimum number of living individuals who were interred (either whole or in part during the original mortuary rites) in each mortuary context. Each tomb at Elst Ar contains the intentional assemblage of human and nonhuman animals, in part or whole, subjected to *relational osteobiographical analysis*. Each analysis integrates osteobiographical information from the application of bioarchaeological and zooarchaeological methodologies to the osteological materials that comprise the interspecies assemblage. *Relational osteobiographical analysis* puts the assemblage back together in order to 1) render the lived experiences of those humans and domesticated herd animals (five muzzled beasts) legible and 2) examine the relationships constructed between them through mortuary practice in order to hypothesize as to what animated the assemblers.

7.5 Towards Relationships as Lived and as Constructed

The first step examines the entangled lives experiences of those humans and domesticated herd animals who led a mobile pastoral life and interprets those lives as an assemblage, hypothesizing that the interspecies entanglements in life of that mobile pastoral society shaped the material bodies in the grave. The second step, analyzing the constructed relationships produced by the mortuary rituals of those who assembled the Xiongnu tombs and the interspecies assembled therein, draws on what is known or hypothesized about the Xiongnu, interspecies entanglements, living materiality, and mobile pastoralism, relational osteobiographical analysis posits that the specific associations of particular humans and five muzzled beasts were intentional, and deeply significant. In general, archaeological research on the relationships constructed between humans and other animals in Xiongnu mortuary space interprets these associations as methods of honoring a specific deceased human in a given tomb. These interpretations invoke ideas of sacrifice, where the domesticated herd animals interred with that human were dispatched as companions for the afterlife and/or consumed as part of a funerary feast. While such perspective on nonhuman animals in Xiongnu mortuary space have been productive and valid, this project tables these interpretations and posits that examining the tomb-scale interspecies assemblage as that tomb's intentional core brings a fresh perspective to Xiongnu mortuary practice, ideology, and politics.

In particular, I hypothesize that Xiongnu mortuary practice asserted a core ideological tenet, rooted in the mobile pastoral lifeway, through multiple unique iterations (i.e., each tomb): we – humans along with five muzzled beasts – are herds. The herd was a – if not the – fundamental unit of Xiongnu society as a mobile pastoral society, and it was acknowledged to be an interspecies assemblage. The herd was a shifting web of inherently material interrelations (Mlekuž, 2013) that transformed along temporal (seasonal, ontogenetic) logics. Without herds, there are no herders; without herders, there are no herds. In the following Xiongnu relational osteobiographies generated from the eight multispecies mortuary assemblages from Elst Ar

But there is no universal herd, which any herder would know at an intimate scale. A herd is fluid, swelling in some seasons and shrinking in others, and ever-changing. Last year's lambs are this year's ewes, wethers, and rams. This fall's heifer will be next summer's milk cow. The spring that blesses a herder with twinning nanny goats one spring that result in a bumper crop of kids may bring a bad bout of intestinal parasites that kill wethers, ewes, and lambs. Seasonality and ontogenetic development are two intertwined temporal logics that animate a mobile pastoral lifeway, and shape what constitutes a given herd at a given point in time.

Moreover, any herd in a mobile pastoral context of necessity includes humans. As discussed at length in Chapter 5, there are no herds without herders. The human-herd animal assemblages at Elst Ar manifest a social configuration beyond the general understanding of 'herd' as a nonhuman animal collective. The Xiongnu made explicit and material that which could be elided when considering domesticated herd animals on their own: that the complex, close entanglements of humans and their herd animals constitute the beating heart of mobile pastoral lifeways. Chapter 9 will present a case for an expansion of the herd that consciously folds the human back into the flock: the pastoral fold as a biopolitical assemblage.

The following eight *relational osteobiographical accounts* are specific herds in time and space, made up of particular humans and domesticated herd animals in their ages (and skeletal sex) which is the time that they died. Each interspecies assemblage at Elst Ar starts with the lives of the human herders and domesticated herd animals that lived their lives entangled with other herds and five muzzled beasts together. What follows are *relational osteobiographical* interpretations of the entangled lives and death of particular humans and herd animals in eight Xiongnu tombs at Elst Ar rooted in their bodily materials and intentional associations.

CHAPTER 8

THE ELST AR RELATIONAL OSTEOBIOGRAPHIES

8.1 Introduction

The eight relational osteobiographies in this chapter offer empirically-grounded narrative interpretations of human and herd animal remains deliberately interred together by living Xiongnu in their ring tombs at Elst Ar. Each relational osteobiography presents the once-living Xiongnu person or people as they would be understood through traditional osteobiography: a bioarchaeological construct of an individual human's life history written in bone and teeth. The next step of each relational osteobiography expands the field of analysis to the multispecies mortuary assemblage: all the once-living social beings who Xiongnu deliberately placed together in death. Part of this expansion is a re-orientation to the relationships between these once-living social beings as interspecies, bodily relationships: the bodily interactions at the core of herder-herd animal entanglements described in Mongolian and southern Siberian ethnographies (see Chapter 5). These interspecies relationships build from the osteological evidence of these lived experiences to the human-herd animal relationships constructed by living Xiongnu through mortuary ritual. The result is eight narrative interpretations of what living Xiongnu at Elst Ar performed and enacted using the raw materials of their mobile pastoral lifeway: herders and their herd animals arranged into specific constellations again and again.

The relational osteobiography crafted for each of the eight multispecies mortuary assemblages from Elst Ar receives a modern Mongolian designation to account for a theme emergent from the interspecies relationships that constitute that assemblage: *Akhmad*, *Khos*, *Saakhalt*, *Dog' Tolgoi*, *Khaikhramj*, *Mal Tuugch*, *Achigch*, and *Bairtsgüi*. Each of these relational osteobiographies concludes with a narrative account of the once-living social beings – people, sheep (and/or goats), horses, and/or cattle – embedded in a web of interspecies relationships in life and in death. Each relational osteobiography grows from specific bodily details of those once-living social beings and their particular interspecies relationships into a plausible window onto what motivated the Xiongnu (at Elst Ar and beyond) to assemble humans and herd animals together again and again in their tombs.

8.2 The Relational Osteobiographies

8.2.1 Akhmad *(1st relational osteobiography – Grave 001)*

At least 17 individuals comprised the assemblage of humans and other animals in Grave 001: a human, four horses, five cattle of various ages, four sheep, one sheep or goat, one lamb or kid, and one subadult small ground rodent (probably a pika or mouse) that likely entered Grave 001 after the initial mortuary rituals and tomb construction (see Appendix E for more information on the bioarchaeological and zooarchaeological analyses that generated these results). Therefore, those who engaged in the mortuary practice that created Grave 001 assembled together at least 16 individuals (or some of their body parts).

A traditional osteobiographical analysis of Grave 001 at Elst Ar would start with the human osteological remains. Said human remains evince a relatively long life of hard work, physical trauma, and a multitude of paleopathologies distributed throughout the cranial and postcranial skeleton (see the Appendix E for a complete osteobiographical profile).

Bioarchaeological analysis indicates that a minimum of one human individual was buried in Grave 001: Human EA01. Traditional osteobiography often places its object of analysis (a human skeleton) in its archaeological context to render it intelligible: linking bioarchaeological information to practices and activities specific to the context in question. This application of osteobiographical analysis enlivens the archaeological imagination with interpretive schema that open new, creative possibilities for understanding a given past.

In the case of Human EA01, Grave 001, and the Xiongnu cemetery at Elst Ar, traditional osteobiographical analysis would begin with the mortuary context and interpret from there. Human EA01 was intentionally buried in a circular tomb, a Xiongnu mortuary context designated 'elite' by many archaeologists (see Honeychurch, 2015). However, for a local 'elite', Human EA01 has the bones of someone who led a life of regular, intense physical engagement with the world. If Human EA01 was a member of the local Xiongnu elite, then they were not the kind of elite who sits back at leisure. Joints throughout their body – including their shoulders, elbows, knees, hands, and throughout his back – are worn to extremes due to intense, long-term physical strain. The regular, long-term heavy biomechanical workloads consistent with such wear do not accord with a life of leisure. Degenerative joint disease (DJD) through the skeletal system attests to the labor and toil that Human EA01 undertook regularly for long phases of their life, although in isolation these paleopathologies do not indicate specific activities responsible for their emergence. While the type of mortuary context in which Human EA01 was found may imply that they held elite status in Xiongnu society, from the perspective of their body, Human EA01 lived a life more on par with what we might envision as a manual laborer's life.

Human EA01's bones tell not only of toil, but of trauma. In addition to the regular, long-term biomechanical workload that shaped Human EA01's skeleton, events of physical trauma left their marks as well. Human EA01 survived at least one major traumatic episode that fractured numerous ribs, dented their skull in two places, and broke a component of their spinal column. Human EA01 survived almost all of these traumatic events long enough for their bones to reknit, albeit imperfectly in many cases, including: a repetitive stress fracture at the base of their spinal column[60], fusions between different bones at two different sites in the spine where they articulate in the skeletal system's misguided attempt to restore what physical trauma destroyed[61], a major bony deposit on the left auricular surface, a smashed nose, a permanently dented left zygomatico-temporal suture of arch, and a healing crack to their crown at bregma. The traumatic separation of two portions of a single vertebra in their lumbar spine, the fusion between the 12th thoracic vertebra (T12) and the first lumbar vertebra (L1), and the major bony deposit on the left articular surface between their hips and spine strongly indicate that Human EA01 experienced restricted mobility as these traumatic events accumulated in their bones.

These paleopathological indicators are plausibly consistent with a favorite interpretation of Iron Age Eurasian steppe elites: the warrior. Interpretive frameworks for prehistorical and historical mobile pastoral peoples across Inner Asia invoke an archaeological subject that transcends time and historical specificity in the warrior, drawing from a fluid articulation of cultural myths, historical accounts, anthropological categories, and material culture (Hanks, 2008). Interpersonal violence and martial pursuits associated with the concept of a 'warrior', including among Iron Age nomadic peoples in eastern Eurasia, could be responsible for the healed and healing fractures from which Human EA01 suffered, including the blow to his skull

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[60]The lamina of a lower lumbar vertebra (likely the fifth lumbar, L5) separated from the vertebral body in a case of bilateral spondylolysis (see Appendix E).
[61]The 12th thoracic vertebra (T12) and first lumbar vertebra (L1) are fused; an indeterminate thoracic vertebra fused to a left rib head.

that was still healing at the time of their death[62]. Items from the broader mortuary assemblage interred with Human EA01 could be marshaled in support of this interpretation. Mongolian archaeologists recovered several small finds and fragments fashioned from nonhuman animal bone in Grave 001 at Elst Ar, which they argued in the 2012 field report were components of a bow grip and a four-pointed projectile piece (likely an arrowhead: Erdenebold et al., n.d.b).

Yet signs of acute or distinct physical trauma often attributed to interpersonal violence are absent from Human EA01's skeleton. Perimortem trauma – cuts and injuries to the skeletal system that have not had a chance to begin healing before the person dies – can indicate interpersonal violence, but it is almost entirely absent in this case. Evidence for only one possible perimortem wound exists in Human EA01's bones. The healing fracture on the left side of Human EA01's head resembles a simple linear fracture of the cranial vault of low velocity blunt-force trauma rather than high-velocity or small-object-caused impact trauma fractures[63]. In other words, this was not a classic 'warrior' wound, although it is the closest there is to such an injury in Human EA01's skeleton. Furthermore, the extensive DJD throughout his skeleton bespeaks long-term engagement in strenuous physical work and activity, not necessarily of a 'warrior' lifestyle.

Bioarchaeological analysis can rarely specify the exact activities that create degenerative joint disease in an archaeological skeleton. Even the proximal cause of physical trauma may be challenging or impossible for the bioarchaeologist to determine. For example, bioarchaeological methods can rarely demonstrate that fractured ribs resulted from a fall from a horse, rather than a tree, a chariot, or a rock ledge. But bioarchaeologists join archaeologists in generating

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[62]See Appendix E for a full bioarchaeological narrative account of the indicators of physical trauma recorded in the osteological materials that comprised Human EA01.

[63]See Appendix D on bioarchaeological and zooarchaeological methods with specific reference to Lovell (1997).

interpretations of empirical evidence that enhance understanding of or insights into a given past. This is what makes an osteobiography a compelling tool of bioarchaeological analysis: it uses close analysis of human skeletal remains to weave an account of a particular life and death in cultural context, complete with possible activities, practices, and bodily events that literally made the body in question. A traditional osteobiography generates a plausible interpretation of the activities, practices, bodily events, and lifestyle of the individual in question through close bioarchaeological analysis of the preserved osteological materials. A traditional osteobiographical account of Human EA01 begins and ends with Human EA01. Yet a relational osteobiographical approach expands close osteological analysis to an account of Human EA01 in relation to the nonhuman animals interred with him.

Human EA01 was buried along with at least 15 other individuals (or at least some of their body parts): adult horses, four adult sheep, a lamb or kid, an adult sheep or goat, and several cattle of various ages. If we take seriously the arguments of living materiality and relational osteobiography – that interspecies entanglements or human-animal relationships are material interactions mediated by bodies that then shape those bodies – then what do the horses, sheep and possibly a goat, a lamb or kid, and cattle *in relation to one another and to Human EA01* suggest?

Consider for a moment that what was significant in Grave 001 was not so much Human EA01, but Human EA01 together with these domesticated herd animals. Place Human EA01 in context and re-envision them as *Akhmad*[64], the elder who accompanied these domesticated herd animals into the tomb, rather than Human EA01 alone. Human EA01 is a bioarchaeological construct from osteological materials; *Akhmad* was a specific person, a human member of the

[64] *Akhmad* (ахмад) is the modern Mongolian term for 'elder', 'senior', and for the rank of 'captain' in the armed forces (Bawden, 1997).

Xiongnu community at Elst Ar. *Akhmad* did not live in isolation and they were not buried alone; they were intentionally placed in their grave as part of an multispecies assemblage. Members of *Akhmad*'s community placed them in relation to at least 15 other (nonhuman animal) individuals (or their parts) through mortuary ritual. When the constitutive elements of this interspecies assemblage – *Akhmad*, adult horses, adult sheep (and perhaps a goat), a lamb or kid, and cattle of various ages – are analyzed for their specificities and particularities *in relation to one another* and on their own terms, what interpretive possibilities emerge?

Akhmad's skeleton is a palimpsest of arduous, bodily labor punctuated by physically-traumatic events consistent with a life of interspecies entanglements in a mobile pastoral life: breaking horses; castrating yearling bulls; managing rams; shearing full-grown sheep; slaughtering horses and cattle; holding foals so that their mothers may be milked; gripping lead lines, reins, shears, coats, horns, and forelimbs day after day, season after season, year after year. And with each bodily, material encounter with struggling heifers, ornery billy goats, and bolting horses, a toll of low or high cost is paid by *Akhmad*'s body: a kick here, a head-butt there, and a few rib-cracking, spine-shattering falls from a horse for good measure. These activities and events comprise the interactions with and relationships between *Akhmad* and other human and nonhuman animals in a Xiongnu mobile pastoral community of Central Mongolia mediated materially through the bodies involved.

We may easily envision activities that involved more than just *Akhmad* and one herd animal. *Akhmad* holds a young yearling bull down while an older man wields the knife to castrate, their hands and knees touching as they share a day of intense work, orbited by teenagers hauling new steers-to-be to where the two elders sit and by children collecting the Rocky Mountain oysters for the evening's feast. When a skillful group of equestrians gather to break green horses, a truculent filly drags a young woman by an ineffectual lasso after throwing *Akhmad* from her bucking back to the hard steppe ground. *Akhmad* scoops up a small boy and tosses him away before a passing ram can even decide whether to butt him.

In order to analyze the nonhuman animal osteological materials from Grave 001, zooarchaeological methodologies practically and interpretively separate those remains into a zooarchaeological assemblage apart from *Akhmad*. The zooarchaeological component of the Grave 001 interspecies assemblage consists of four adult horses, five cattle of various ages, four adult sheep, one lamb or kid, and one adult sheep or goat. Two of the four adult horses were geldings or stallions, who died around 13 and over nine years of age, respectively. The five cattle span a range of age groups. The youngest cow died between five and nine months of age, perhaps a calf not yet fully weaned from its mother. Slightly older was the second cow, a weaner[65] or yearling calf who died between 8 and 13 months of age. The third cow died between 30 and 36 months of age, making it behaviorally and reproductively an adult but skeletally a subadult. The two remaining cattle died at indeterminate ages with no signs that their skeletons were still growing or that their teeth were still erupting.

Together the sheep and possible goat are the largest cohort in Grave 001. Four adult sheep and an adult sheep or goat[66] join a very young sheep or goat who died between birth and three months of age (i.e., a lamb or kid). This lamb or kid likely died closer to birth than to three months of age[67], and thus likely still nursed from its mother. The ages-at-death of the two youngest cattle and the lamb or kid suggest that Grave 001 was constructed in spring, a taxing

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[65]A weaner calf refers to a young cow less than a year old but past the age that it has been weaned; a yearling calf is one year old.
[66]See Appendix C on sheep (*Ovis aries*) vs. goats (*Capra hircus*), and the bioarchaeological and Appendix D on *Ovis aries* vs. *Ovis/Capra*.
[67]See Appendix D.

season for modern Mongolian herders when the intense work and stress of lambing, kidding, and calving (and, a bit later, foaling) intersects with extreme, unpredictable weather[68]. Particularly informative for assessing Grave 001's seasonality is the lamb or kid (infantile *Ovis/Capra* individual) who died between birth and three months of age[69].

Who were these domesticated herd animals? All four horses were adults, meaning that their skeletons bore no signs that they were still growing and developing. In Inner Asian mobile pastoral lifeways, including present-day Central Mongolia, an adult horse can be variously ridden, milked (if mares have given birth that year), used to pull carts, and eaten in one lifetime. But the horses who died around 13 and 9+ years of age were rather long in the tooth for good eating. Those two lived a decade or more in relation to other horses, sheep, maybe goats, cattle and herders. They could have been ridden, milked, hitched to carts and wagons, joined with a rider to help shepherd herds and flocks between pastures and encampments daily, seasonally, and over years.

The five cattle embody different life-stages for domesticated large bovids in an Inner Asian mobile pastoral context. The 5-to-9-month-old calf was likely still nursing from its mother and getting accustomed to grazing when it died. Although not as tiny and dependent on their mothers as very young calves are, 5-to-9-month-old calves are noticeably smaller than their full-grown counterparts. The 8-13-month-old was a weaner calf[70] or young yearling, and likely died before it could be bred (if a heifer) or castrated into a steer (if a bull calf). Thus, although it

[68]Appendix E discusses the seasonality assessment for this mortuary context using *tavan khoshuu mal* birthing seasons from Sambuu (1945/2000) from mid-20th century Mongolia sorted by ecozone in comparison to the birthing schedule from Erdenetsogt (2014). Both seasonality assessments are in broad agreement that the mortuary practices that created Grave 001 likely took place in spring.
[69]Age-at-death assessment for the kid/lamb was based on state of dental eruption. See Appendix C for discussions of the seasonalities of key animal husbandry practices. For a full description of the zooarchaeological methods used to derive age-at-death estimates for this specimen and other subadult nonhuman animal specimens from Elst Ar, see Appendix D.
[70]A weaner calf is under 12 months of age but already weaned from its mother's milk.

may have reached a large size and nutritional independence from its mother, the weaner calf would likely have belonged in a herd of younger cattle (Sambuu, 1945/2001).

The three adult cattle – whether actual cows, yaks, or their various hybridizations[71] – would have been cows (females who had given birth), heifers (females who had not yet had their first calves), steers (castrated males), or bulls (intact males) when they died. One of the three adult cows may have been the calf's mother, making a pair in the afterlife as they did in life. One of these three cattle died between 30 and 36 months of age, making it behaviorally and reproductively an adult but skeletally a subadult[72].

The sheep (and one possibly a goat) were four adults, skeletally mature and finished growing. Such sheep (and possibly a goat) would be ewes (or nannies: females), wethers (castrated males), or intact males (rams or billy goats/bucks). The lamb or kid died at an age relatively near birth, strongly indicating that a recent lambing season – a major event in any pastoral lifeway that necessitates major material involvement from herders – occurred less than three months before Grave 001 was assembled. The lamb or kid also means a mother (an ewe or a nanny goat) who was producing milk (i.e., nearing or at the outset of sheep milking season).

In constructing a *relational osteobiographical account* of Grave 001, it is time to reintegrate the interspecies assemblage. What interpretive possibilities emerge when *Akhmad* and the four horses, five cattle, four sheep, one sheep or goat, and lamb or kid, are reunited? When these representatives of living materiality that comprised the core of Grave 001 at Elst Ar are reassembled, we can see immediately that they embody the full species range of the Xiongnu

[71]See Appendix C for more on cattle in Inner Asian and Mongolian mobile pastoral contexts.
[72]Cattle in the 30 to 36-month age range are *shüdlen guna* (шүдлэн гуна: steer/castrated male) or *shüdlen günj* (шүдлэн гүнж: female) in modern Mongolian mobile pastoral age classification schema (Erdenetsogt, 2014). The term *shüdlen* is related to the modern Mongolian words for "tooth" (шүд: *shüd*) and "to grow teeth; to age an animal by its teeth" (шүдлэх: *shüdlekh*). According to Bawden (1997), the *shüdlen* (шүдлэн) designation applies to horses, cattle, sheep, and goats in the third year of life.

mobile pastoral lifeway at Elst Ar: human, horse, cattle, sheep, and goat. The Grave 001 interspecies assemblage is a particular yet expansive iteration of the herd collected together and fixed in relation to one another in the tomb.

Viewing the interspecies assemblage from Grave 001, the intentional constellation of living materiality in this Xiongnu mortuary context, as an integrated whole facilitates a potential interpretation of the lives therein. *Akhmad* and these domesticated herd animals belonged together, from the perspective of those who assembled them, in death. In life, *Akhmad* worked hard his entire life as hands-on, engaged herder in a mobile pastoral context. We may posit that *Akhmad* was significant to the Xiongnu who buried them because they were a skilled, life-long herder. We may posit that the horses, sheep (and goats), cattle, and lamb/kid assembled together with *Akhmad* in mortuary practice were significant to the Xiongnu who buried them because they embodied particular aspects of mobile pastoral life (seasonality, different facets of political economy, affective ties, individual life-histories). Moreover, we may posit that *Akhmad* and these domesticated herd animals were significant *because of their relationships*, specifically the constructed relationships between them (their intentional association in the tomb) which operated upon the lived experiences as interspecies entanglements that shaped those relationships.

Did *Akhmad*, the four horses, the adult sheep (and possibly a goat), the cattle, and the lamb or kid interact and live in relation to one another when they were alive, before they were assembled together in Grave 01? Perhaps. Perhaps the four horses belonged to the same herd, living most or all of their lives together, and *Akhmad* may have ridden or broken one or all of these four horses. Perhaps the lamb or kid accompanied its mother (one of the adult sheep or goats in Grave 001), and *Akhmad* may have assisted her in delivering this lamb or kid. Perhaps the cattle, the sheep, and the horses grazed together in the pastures of the Xiongnu community at

Elst Ar, coming together for some times of the day and year and separating for others. These are possible but unproveable from osteological materials alone (although DNA contained within these materials could indicate genetic relationships between certain herd animals). But it does not actually matter whether all components of the interspecies assemblage lived or interacted with one another before death. *Akhmad* may have never ridden any of these four horses, the cattle may have all come from different herds, and so forth. This does not pose an analytic problem for two reasons. First, that *Akhmad* and these specific *tavan khoshuu mal* lived their lives within a mobile pastoral context that entailed their involvement in some or all of the bodily practices and events described above. Second, that those who assembled *Akhmad* and these specific *tavan khoshuu mal* during mortuary ritual thought and acted as if they belonged together.

The lived experiences embodied in the osteological remains of Human EA01 and the numerous nonhuman domesticated animals attest to bodily, material events and interactions over the course of each lifetime. The *ideological gloss* or *socio-cosmological argument* made by the assemblers who intentionally associated these manifestations of living materiality in Grave 001 chose to work with and through the specificities of such living materiality. *Akhmad* was not just a random person or an interchangeable part; the four adult horses were of specific ages and likely sex, with their own life-histories and relationships to the living and perhaps the dead; the lamb/kid was of a specific age, born of a particular ewe and ram and from someone's flock; and so forth. If we take the argument that these specificities of living materiality actually *mattered* and were made to matter in mortuary ritual and space, then the relational osteobiographical approach to Grave 001 generates an intriguing perspective on the Xiongnu world. When *Akhmad* and the fourteen herd animals are rearticulated as an intentional assemblage, then their osteobiographical particulars are understood as resulting from and shaping their lived experiences. But the specific composition of the Grave 001 interspecies assemblage is the work of those who assembled *Akhmad* and these *tavan khoshuu mal* in mortuary practice. The possibility emerges that specific herders and herd animals – human and nonhuman animals – are assembled into a particular iteration of the herd. Constituting a herd in a Xiongnu tomb, itself a space of intense ideological, political, and cosmological significance, hints that herds and their assemblings were key concerns of Xiongnu mortuary practice.

8.2.2 Khos *(2nd relational osteobiography – Grave 022)*

Like Grave 001, Grave 022 held the remains of beings representing the entire span of herder-herd relationships of Xiongnu mobile pastoralism at Elst Ar: horses, cattle, sheep (and possibly goats), and, of course, humans. However, where *Akhmad* was the sole human to accompany a herd of five muzzled beasts embodying all species identified at Elst Ar at different bodily life-stages in Grave 001, at least two human individuals joined numerous herd animals in Grave 022: Human EA16 and Human EA17. Of the eight Xiongnu graves at Elst Ar analyzed for this project, half included at least two people. Like many Xiongnu graves across Mongolia and the broader Xiongnu world, Grave 022 was disturbed at some point before archaeological excavation. Archaeologists encountered the human remains, along with the nonhuman animal bone and artifacts, jumbled together. As is the case for many disturbed mortuary contexts, identifying which skeletal remains belong to which individual – Human EA16 vs. Human EA17 – poses a significant challenge. The bioarchaeological individuals constructed from commingled and incomplete human skeletal systems are partial at best. Here emerges the first challenge to traditional osteobiography: how to construct the life narrative of an individual body when it is unclear whose bones are whose.

One individual from Grave 022 emerges in some detail: Human EA16. Based on what remains of a pelvic girdle and a spine (vertebral column) that belongs with it, Human EA16 died between the ages of 35 and 40. Human EA16 presents an ambiguous skeletal sex in what remains of their pelvic girdle. What is very clear from these bones is that Human EA16 was born with an unusual but asymptomatic condition of the lower back. Over the course of a lifetime, years of hard work appear to have curved the lower back to the left, leading some bones of the lower spine and hips remodeling and folding over on to other bones for support. Human EA16 lived well into adulthood despite the impingements and degeneration of the lower back that likely caused significant pain over time and may have impeded participation in a number of activities (including walking and horseback riding).

On the one hand, these nonstandard presentations allow an empirically grounded reconstruction of a bioarchaeological individual, as markers of these conditions appear across multiple articulating bones. On the other hand, the altered and heightened biomechanical stress that catalyzed these nonstandard bone morphologies impacted the pelvic girdle, a key site for the bioarchaeological assessment of skeletal sex using nonmetric traits. The assessed skeletal sex and estimated age at death that for Human EA16 rely on just those parts of the pelvic girdle (hips and lower back) clearly changed by the collapse and folding of the spinal column over time. In other words, the very bony information that reveals life details about Human EA16 (paleopathologies of the lower spine and pelvic girdle) obfuscate other details that would flesh out the bioarchaeological construct of this individual (i.e., osteological features used to assess skeletal sex and estimate age at death).

Human EA16, as a bioarchaeological construct and as a once-living person, accompanied at least one other human in Grave 022: Human EA17. Little can be said with confidence about Human EA17 (see Appendix F). The "duplicate" bones that evince the presence of two human individuals are not ones suitable for nonmetric aging and sexing methods used in this project. No solid empirical basis exists at this point for assigning one "duplicate" to Human EA16 and the other to Human EA17. A marked difference in the size – heft, length, and rugosity – of the duplicated upper and lower limb bones from Grave 022 reinforce the estimation that a minimum of two human individuals were buried there. These differences are most striking in the recovered "duplicates" of bones of the foot, upper leg (femora), and arm (humerus, ulna, and radius). The foot bones in particular, for which almost two complete sets of left and right foot bones were identified, evince the presence of one larger person and a second, smaller person riddled with degenerative joint disease. On the other hand, pronounced muscle attachment sites in the upper body – arms, chest, and shoulders – appear across the "duplicate" bones without correlating to relative bone size. Despite observable differences in certain duplicated bones, the available evidence does not support the reconstruction of two complete individuals by aligning the bioarchaeological constructs align with the once-living people.

If little can be said with confidence about Human EA16 and Human EA17 as individual bioarchaeological constructs, perhaps something can be inferred from their intentional pairing by the Xiongnu who placed them together in Grave 022. When the remains of two humans are found in a single mortuary context, archaeologists may argue for the practice of human sacrifice, as in cases of archaeological interpretation of significant Xiongnu mortuary contexts in Transbaikalia (Derestuy: Minyaev, 2007) and Mongolia (Burkhan Tolgoi in the Egiin Gol drainage of northern Mongolia: Murail et al., 2000). Although previous scholarship in Xiongnu archaeology has critiqued human sacrifice as interpretive framework used to analyze double or multiple interments (Miller, 2009), at Elst Ar the key question is whether the available evidence attests to the phenomenon of human sacrifice in Xiongnu mortuary practice.

Evidence supporting the practice of human sacrifice in Grave 022 at Elst Ar and the human remains could include: taphonomic data indicating that Human EA16 and Human EA17 were buried at the same time; bioarchaeological evidence of a violent death for one but not both individuals; and/or spatial data on the arrangement of Human EA16 in reference to Human EA17. The disturbed nature of Grave 022 at Elst Ar obliterated such taphonomic evidence along with the spatial organization of the tomb's contents. Moreover, bioarchaeological analysis of the human remains yielded no signs of physical trauma beyond seven healed rib fractures. Human sacrifice cannot be ruled out definitively at Grave 022. But the lack of empirical evidence for the practice encourages the analyst to consider alternative interpretive schema to understand double or multiple human interments in the Xiongnu cemetery at Elst Ar.

Consider that Human EA16 and Human EA17, whatever their identities and lived experiences, were made into a pair by the members of the Xiongnu community who assembled them, along with eleven other beings, at the Elst Ar cemetery. In the case of Grave 022, the multiscalar quality of relational osteobiographical analysis enables us to consider an assemblage within the wider interspecies assemblage. This would be Human EA16 and Human EA17 as they are encountered archaeologically: an intentionally intermingled ensemble. This scale of relational osteobiographical analysis examines the two humans as a pair, and interprets their interrelationship constructed in death and the bodily relations in life that can be hypothesized from their bones and teeth. A second scale of relational osteobiographical analysis expands to the full interspecies assemblage intentionally gathered in Grave 022 through Xiongnu mortuary practice.

At the first scale of relational osteobiography, Human EA16 and Human EA17 present as a pair intended by those who assembled them in Grave 022. If the double burial is interpreted as a result of human sacrifice, then the logics driving this component of mortuary practice are baked into the interpretive framework: one human is sacrificed to accompany a deceased individual. Even if we can overlook the absence of empirical evidence for human sacrifice within the bioarchaeological dataset, we ought to ask why one individual was sacrificed to accompany the other. Some interpretations would marshal 'common sense' to infer the relationships that would explain this particular burial and human sacrifice: husband and wife; servant and master; or captor and victim. But these interpretations of the pairing of Human EA16 and Human EA17 require the imposition of two analytics. First, that human sacrifice was a component of Xiongnu mortuary practice at Elst Ar, despite the absence of empirical evidence. Second, that the 'common sense' social roles used to explain this instance of human sacrifice are not culturally specific or rooted in empirical evidence. That Human EA16 was a chieftain or master and Human EA17 was a concubine or slave sacrificed to accompany him: 1) has no empirical basis rooted in mortuary or bioarchaeological analyses; 2) is tautological. Human EA16 and Human EA17 were buried together, one was sacrificed to accompany the other, thus one was a chieftain or master or victor and the other was a vassal or slave or captive, because that would make sense of why Human EA17 was sacrificed and buried with Human EA16. Rather than impose a set of social roles on this pair of humans, what do their bodily material remains suggest about the lives that produced and lived through them?

Whatever the precise logic behind this pairing, Human EA16 and Human EA17 belonged together in the eyes and actions of those who assembled Grave 022 at Elst Ar. If we shift our methods from traditional osteobiography that constructs individuals to relational osteobiography, then we analyze skeletal remains in relation to one another. Human EA16 and Human EA17, two bioarchaeological individuals whose full elaboration exceeds our interpretive grasp, become *Khos*[73], a pair who experienced hardship and burden in life and were matched together in death. When looking holistically at the human remains – *Khos* – as a relationally-constituted entity in Grave 022, qualities and attributes of those remains suggest a suite of bodily activities, practices, and events within a mobile pastoral way of life.

The osteological materials that comprise our pair, *Khos*, include a bodily record of hard work, in an idiom similar to that observed in *Akhmad* in the first relational osteobiography. In addition to the marked paleopathologies of the lower spinal column and pelvic girdle, where the bones had collapsed and folded over onto themselves, signs of joint wear pepper the rest of the spinal column, along with joints in the chest, shoulders, and hands (including severe osteoarthritis and a possible healed fracture of a fingertip). Seven ribs distributed between the right and left sides of the body had broken near where they joined the spinal column at some point in life. While all seven breaks were healed when *Khos* died, these ribs had reknit unevenly, consistent with bones trying to rejoin themselves when they are not properly stabilized.

The human element of *Khos* embodies a complex of bodily record of activities, events, and practices. The pain and impeded mobility evidenced in the bones of the lower back and pelvic girdle bespeak a life lived in a world of social support and material aid. This aspect of

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[73] *Khos*: (xoc) "pair, couple" (Bawden, 1997).

Khos lived well into adulthood, long enough for the causes of their discomfort to manifest unambiguously in bone. This aspect of *Khos* may have needed increasing help in daily life and was a valued enough member of their community to receive it. Other portions of the human skeletal system display worn joints and highly developed sites of muscle attachment in the arms, legs, and shoulder girdles that suggest a lifetime of arduous, intense physical activity. This second aspect of *Khos* worked hard for years, bearing the literal weight of responsibility for the community's mobile pastoral lifeway through their limbs and spine. Taken as a pair assembled by the Xiongnu who created Grave 022 at Elst Ar, *Khos* embody the complex entanglement of human labor and mutual care fundamental to a mobile pastoral lifeway. They are a core human dynamic of Xiongnu mobile pastoralism made flesh and bone.

But if we consider *Khos* as the result of bodily interactions in life, intentionally assembled together in death, the other once-living beings that joined them in death call for our attention. Recall the argument that *Khos* are significant not just in relation to one another, but in their relations to the other eleven occupants of Grave 022. When *Khos* is placed with the eleven herd animals that comprised the tomb-scale interspecies assemblage, what interpretive potential does this second scale of relational osteobiographical analysis enable? Eleven other once-living beings, or their component parts, joined Humans EA16 and EA17 in Grave 022: one foal; two adult horses; two cattle and a yearling cow; one ram; one lamb or kid; and four sheep or goats. Collectively these herd animals represent all the nonhuman herd animal species present in the Xiongnu mobile pastoral world evidenced in the Elst Ar cemetery into an intentional interspecies assemblage.

A minimum of three horses joined the interspecies assemblage of Grave 022. These were specific and particular horses, as evidenced in their bones and teeth. The first was a very young foal when it died at no more than two months of age. Its bones suggest the foal was closer to birth than this maximum possible age. Such a foal would not yet have been weaned, still nursing from its mother and just beginning to eat grass when it was placed in the Grave 022 interspecies assemblage. Was one of the two adult horses its mother? Where one of the two was an adult horse of indeterminate age, the skeletal system of the second was still maturing. The growing horse died near to but younger than three-and-a-half years of age; in pastoral contexts like modern Mongolia, this horse would have transitioned into equine adulthood through the different paths of a horse's life. If male, it would be gelded already if not allowed to become a stallion, and separated from his mother's herd to live with other bachelor geldings (Fijn, 2011). If female, it might have been a first-time mother, just beginning her life as a mare rather than a filly. Whether male or female, by this age a riding horse would have been broken to bear the weight of a human rider, marking the start of its life distinct from horses living in herds as a close companion of at least one human. Of these three horses, two were full of potential: a foal just starting its life, and an old *daaga* or young *shüdlen* (near to but less than 3 to 3.5 years of age at death: see Appendix B, C) that recently crossed the threshold into equine adulthood.

Two adult cattle and one yearling cow round out the rest of the *bod mal* – the large-bodied domesticated herd animals of modern mobile pastoral Mongolia – in Grave 022. While the two adult cattle died at indeterminate ages, with no signs that their skeletons were still growing, the yearling cow died within a fairly narrow timeframe (14-17 months of age at death). In these earlier months of its second full year of life, such a *byaruu* or yearling cow died in the midst of a key transitional phase for Mongolian cattle (cows, yaks, and their various hybridizations) today: moving from udder to grass, from nursing to grazing (Fijn, 2011). Male *byaruu* in modern Mongolian pastoral contexts undergo another major bodily transformation at the hands of their herders: castration (Erdenetsogt, 2014). Castration separates a few select breeding bulls from oxen (castrated male cattle), the latter of whom may serve as draft animals and/or be processed after death into food and other animal materials like leather.

The *bog mal* (small livestock: Bawden, 1997) consist of one ram, a lamb or kid who died before 6 months of age, a sheep or goat whose skeleton was still growing when it died, and two adult sheep or goats, comprising the largest nonhuman animal contingent in Grave 022. The five of them embody different life paths and bodily realities for *bog mal* in a mobile pastoral context. The ram was allowed to age into male sexual maturity, left intact by the herders who bred and raised him, then separated from the flock of ewes and wethers outside of breeding season. He developed horn that curved back over his skull, making him a force to be reckoned with in the eyes of herders, predators, and rival rams. A breeding ram fulfills a crucial role in a sheepherding context as the father of all lambs; however, his reproductive role is limited to a short period of time (breeding season), and he is usually replaced (slaughtered or traded to another flock) after a few years to avoid inbreeding.

There is insufficient osteological evidence to discern whether the two skeletally-adult and one skeletally growing sheep or goats were rams or billys/bucks, wethers (castrated male sheep/goat), or ewes or nannies/does; nor is there sufficient evidence to discern whether they were sheep or goat. Among modern Mongolian mobile pastoralists, sheep and goat are herded together in an interspecies flock of *bog mal*. Perhaps a similar category operated among the Xiongnu, where sheep and goat were distinguishable but in many contexts were constituted into one cultural or practical category.

The lamb or kid who rounded out the *bog mal* flock died under 6 months of age, with some evidence that it was even younger when it died. A lamb or kid in this age range would have begun grazing but likely still nurse from its mother, entering the early stage of transition into an adult flock member. If this lamb or kid were male and the Xiongnu at Elst Ar followed practices similar to mobile pastoral communities in modern Mongolia, it was of an age to undergo another major transition: castration (Fijn, 2011). Such a major bodily transition for the kid or lamb (if male) occurs at a younger age for sheep and goat in modern Mongolian mobile pastoralism compared to castration of cattle. Thus, if the timeline of castration by species was similar to the modern context, if the *byaruu* or yearling cow that joined this lamb or kid were both male, they occupied a similar transitional state despite the differences in their ages and species. If castrated or female, the *byaruu* and the kid or lamb would join their herds and graze depends on whether they had been weaned from their mothers. Thus, transitions in bodily states and social practices can overlap in mobile pastoral contexts: weaning and castration being two logics that structure herd composition within the broader interspecies assemblage.

When we reconstitute *Khos* and these eleven herd animals into an interspecies assemblage as those who placed them into Grave 022 did, two scales of interpretation emerge from conceptualizing their bodily particularities as the result of complex, lifelong interactions. If the first scale of relational osteobiographical analysis indicates an embodied, inherently coupled dynamic of care and labor that characterized human participation in mobile pastoral lifeways, the second scale of the entire interspecies assemblage places *Khos* in the context created by the Xiongnu who buried them along with eleven other beings. When *Khos* and the herd animals are reassembled, their bodily particularities suggest a suite of interactions between herders and herd animals that animate the interspecies entanglements of mobile pastoral lifeways.

We can envision daily, seasonal, and lifelong bodily activities that comprise interspecies relationships within a mobile pastoral lifeway in the aspect of *Khos* marked by signs of arduous labor over a lifetime, leaving worn joints and marked muscle attachment sites. Hands hold the young foal so that its mother can be milked, grip the shears that trim the wool from fleecy sheep, and expertly butcher the carcass of a full-grown ox. Arms and shoulders strain to haul yearling cattle to the ground for castration, to rein in a truculent horse with the bit in its teeth, and to churn the deep leather bag of mare's milk as it ferments into koumiss. Legs carried *Khos* up and down hills, day after day, herding constantly moving sheep and goats from seasonal encampment to pasture and water source, and back home again each evening. Analyzing the bones and teeth that comprise *Khos* in context as part of an interspecies assemblage evokes these relationships. But looking closely at the bones and teeth of the horses, cattle, sheep and possibly goats intimates a complementary suite of relationships.

The bodily processes and events that anchor those relationships are particularly evident in the osteological remains of the young herd animals: the foal, the yearling cow, and the lamb or kid. All three died during a crucial transition in the lives of young herd animals: the shift from nursing to grazing. Although all three young animals died at different calendrical ages, they embodied the same phase of life. The foal, yearling cow, and lamb or kid occupied a common liminal bodily state where they received nourishment from both udder and grass. Still latched to their mothers, these three animals were taking steps into a fundamental activity of herd animal adulthood: grazing. This transition is a bodily transformation of the young animal changing its biology and social life seen in its relationship to its mother, to the rest of the herd, and to its herders. These young animals grow more independent from their mothers, socialize more with their herd, and require herders to change their practices of care and management to suit the transforming herd.

Yet the liminal state that straddles mother's milk and pasture grass is not the only bodily state manifest in the bones and teeth of five muzzled beasts from Grave 022. The eight other horses, cattle, sheep and possibly goat died as adults at various stages of development. At least two adults from each taxon accompanied the one young animal from each taxon: one foal and two adult horses; one yearling cow and two adult cattle; and one lamb or kid, a ram, a growing adult sheep or goat, and two adult sheep or goats. These eight adult herd animals successfully transitioned through the phase in which the foal, yearling cow, and lamb or kid died. That each young animal at the nursing-grazing liminal phase accompanied at least two adults of its kind in an intentionally constructed space imbued with tremendous ideological significant raises another possible logic enacted at Grave 022. Those Xiongnu who assembled two people into the intentional paired *Khos* may have intentionally matched liminal-stage young herd animals to their adult counterparts. Thus, *Khos* reflects not only the pairing of the human element – care and labor – but pairing within the 'five muzzled beasts' of young with matured.

Did one of the two individuals who comprised *Khos* provide care to the other individual in life? Perhaps; perhaps not. The focus on discrete individuals obscures what their bones tell us. *Khos* lived well into adulthood in reasonably good health, attesting to the help of numerous kith and kin. *Khos* worked over a lifetime to make mobile pastoral life possible for kith, kin, and livestock. The human member of *Khos* who by the time of their death could no longer ride across the steppe on fleet-footed horses, run after wayward sheep, or drive milk cows home on foot for milking, was significant to the Xiongnu at Elst Ar. The human labor of mobile pastoral lifeways includes numerous fundamental activities where restricted mobility would pose minimal difficulty: milking goats, cows, and mares; boiling milk into curds, then pressing and aging them into long-lived dairy products; brushing, carding, weaving, and felting wool and other animal hair into textiles; processing and braiding animal skin into clothing, tools, and other secondary pastoral products; assisting with veterinary care and the involved, gentle care required by newborn, orphaned, and other vulnerable herd animals. These practices of expertise are entangled with a broader array of interspecies activities that sustain the herders and herds of a mobile pastoral community. It would be a mistake to overlook the care manifest in *Khos*'s lower back and hips. That care attests to another dynamic within mobile pastoral lifeways: interdependence.

The interdependence that characterizes mobile pastoral lifeways encompasses human and nonhuman animals together. A domesticated herd animal is the living materialization of thousands of years of ancestors who lived in flocks and herds together with humans. Even during the Xiongnu period, horses, cattle, sheep, goats, and humans had been companion species for generations. Narrowing the timeframe from the longue durée to a lifetime, the eleven herd animals in Grave 022 required the care and management of human herders and owed their existence to herders, just as those herders relied on these animals. Did the horses, foal, cattle, yearling cow, ram, sheep and possibly goats, and lamb or kid form a herd in life? Were they herded by *Khos*? Again, both are possible. However, whether any of these people or herd animals interacted at all during their lives is ultimately unimportant for the same reasons they were unimportant in the first relational osteobiography (*Akhmad)*.

First, *Khos* and the eleven herd animals engaged in all or most of the activities, practices, and interactions described above. Xiongnu herders bred, raised, and cared for these three horses, three cattle, and five sheep or goats, whether or not *Khos* was involved in all those activities with these specific herd animals. The young foal had a mother from which it still nursed at the time it was assembled into Grave 022, whether she accompanied her offspring or not. Second, *Khos* and the eleven herd animals were intentionally assembled together by those who believed and acted as though all thirteen belonged together in death. *Khos* was not the random pairing of two generic people; the three horses were of specific ages and sexes, with their own life-histories and relationships to the living and perhaps the dead; the yearling cow was of a specific age and sex, still nursing from its mother, herself a particular cow of someone's herd; and so forth.

The lived experiences embodied in the osteological remains of *Khos* and these eleven herd animals attest to bodily, material events and interactions over the course of each lifetime. When *Khos*, the three horses, three cattle, and five sheep or goats are reassembled as they were intentionally articulated in Grave 022, then their osteobiographical particulars are understood as resulting from and shaping their lived experiences. But the specific composition of the Grave 022 interspecies assemblage is the work of those who assembled *Khos* and these eleven herd animals in mortuary practice. We may view this project of assembling as a cosmological or political argument asserted through mortuary practice by deliberately selecting and associating particular qualities that constitute living materiality in Grave 022. As mortuary space teems with ideological significance, we may infer that those who engaged in mortuary practice that created Grave 022 at Elst Ar selected and deployed manifestations of living materiality that were significant to them. Mortuary practice operated to reinforce these qualities of living materiality as qualities that mattered.

As in the first relational osteobiography (*Akhmad*), assembling specific herders and herd animals – human and nonhuman animals – in Xiongnu mortuary space may constitute an iteration of the herd. As each interspecies assemblage is unique to its tomb as a discrete unit and a repeated cultural category, we should expect that the particular qualities of living materiality manifest in herders and herd animals that constitute each interspecies assemblage will vary.

Such variation parallels the lived realities of herds, which fluctuate in their composition, behaviors, and sizes along temporal logics of days, seasons, and years that bring growth, death, and change to herders and herd animals alike.

8.2.3 Saakhalt *(3rd relational osteobiography – Grave 012)*

In Grave 012, at least two people were assembled with at least three cattle. As was the case for a number of the Xiongnu mortuary contexts at Elst Ar examined in this project, the archaeologists encountered a co-mingled, disturbed assemblage of human and nonhuman animal remains as they excavated the tomb. Two bioarchaeological individuals can be constructed from the incomplete and commingled human skeletal remains from Grave 012: Human EA06 and Human EA07. However, it is not possible to assign all of the teeth and bones found in Grave 012 to Human EA06 vs. Human EA07. It is a familiar conundrum, seen in the second *relational osteobiographical analysis* of Grave 022 and recurring throughout the Xiongnu tombs at Elst Ar. Grave 012 contains a skeletally-male pelvic girdle of an individual who died between 45 and 50 years of age and a skull that seems skeletally female. Was the pelvic girdle Human EA06 and the skull Human EA07? Were both the pelvic girdle and skull one individual – entirely plausible based on bioarchaeological methods and the biology of sex-linked traits in the human skeletal system – buried along with a second individual about whose skeletal sex and age at death nothing meaningful can be said? Attempts to flesh out Human EA06 and Human EA07 as bioarchaeological constructs based on their skeletal sex and ages at death lead to an impasse.

Beyond indicators of skeletal sex and age at death, the human bones and teeth from Grave 012 contain information about the lived experiences of Human EA06 and Human EA07 .

Where traditional osteobiography struggles with the problem of constructing individuals, perhaps relational osteobiography can offer an alternative methodology for interpreting the humans buried there. Setting aside the need to reconstruct complete individuals – the bioarchaeological constructs Human EA06 and Human EA07 – the assemblage of human skeletal materials as a component within the larger interspecies assemblage contains osteobiographical information about the pair of people in Grave 012. Throughout the remains of the human skeletal system are signs of hard physical work undertaken repetitively over long periods of time comingled with signs of disease and trauma that the afflicted survived long enough to have manifested in bony tissue.

In the head, infections pepper the face, ears, and base of the skull. Perhaps the microbial agents responsible for these infections entered the body through the healed broken nose; perhaps the responsible microbes entered through the open or closing-over empty tooth sockets for the eleven adult teeth lost from the upper jaw over time. A potential explanation for these teeth lost during life appears in one loose tooth from the upper jaw, which is encased in dental calculus. Calculus is the hardened result of microbial life accumulating at opportune sites on teeth, wreaking havoc on humanity's hardest tissues and sending their fellows throughout the bloodstream to cause an array of health problems throughout the body. This oral hygiene issue likely explains the loss of eleven upper teeth during life out of a total sixteen. Infection appears in one left and one right shoulder where the ligaments stabilizing and strengthening the front aspect of that crucial but notoriously fragile joint link the collar bone to the shoulder blade. Counterintuitively, when a bone displays evidence of microbial infection, that bone manifests health and disease simultaneously. Such bony tissue died in the middle of the fight, so to speak. The infected bone belongs to a person who survived the disease long enough for the bony tissue to respond. An infection or disease which killed the individual quickly would leave no physical record in the skeletal system.

Some healed injuries in these bones indicate traumatic events, like the broken nose and a poorly-reknit broken rib. Others attest to regular, long-term stress and strain of arduous physical work: heavily-worn, degenerating joints in the upper chest and throughout the lower back, and a stress fracture in the spine at the base of the ribcage. This last injury split one vertebra through repetitive injury or stress; today, such an injury is associated with divers, weightlifters, and wrestlers (Mann et al., 2016: see Appendix G) that suggests a correlation with regular lifting of literal heavy loads and/or falls. Bony evidence of intense, repeated biomechanical work – including regular lifting of heavy loads – appear in the single right femur. Observable in the assemblage of human remains from Grave 012 are signs of hard, physical work undertaken regularly or repetitively over long periods of time alongside signs of physically traumatic events that suggest a range of taxing bodily engagements with others beings and their shared environment over a lifetime.

As in Grave 022, Grave 012 contains an intentional pairing of two people. As in Grave 022, the phenomenon of human sacrifice and the social roles inhabited by these two individuals in relation to one another during their lives could lead archaeological interpretation of Grave 012. 'Common sense' pairings that proffer pose as universal relationships – husband and wife, parent and child, master and servant, victor and victim, liege and bondsman – could motivate those who intentionally associated Human EA06 and Human EA07 in their tomb. Sacrificing one individual, those who produced Grave 012 as a mortuary space would have sacrificed one person and buried two people. As in Grave 022, empirical evidence for human sacrifice is lacking in Grave 012. As in Grave 022, the interpreted relationship between Human EA06 and

Human EA07 imposes universal/transcultural social roles that could be consistent with the sacrifice of either Human EA06 or Human EA07.

Let us accept that those who buried Human EA06 and Human EA07 intended to construct or assert a relationship between them as a pair. Those who buried these two people placed them together with at least three other once-living beings in their tomb. Let us place Human EA06 and Human EA07 in the context that those who buried them intended: together with three other beings. When the interspecies assemblage from Grave 012 is reassembled, what emerges? In contrast to Graves 001 and Graves 022 (the first and second *relational osteobiographies*) at Elst Ar, Grave 012 comprises only two species.

Grave 012 is a grave of cattle. They are cattle embodying distinct life stages and bodily states: a very young calf; a yearling or stirk in its second full year of life[74]; and an adult cow who died between 2 and 5 years of age. The calf was extremely young when it died. It certainly died at less than a month's age, perhaps even dying before birth. At this age, a calf is entirely dependent on its mother for sustenance: milk from her udder or nutrients and oxygen from her body through the umbilical cord and placenta. In the former case, this calf's mother was left bereft of her infant calf; in the latter, she and the calf likely died together. A possibility exists that the adult cow in Grave 012 was this calf's mother, but this is only a possibility. Yet this calf's skeletal remains can tell us something about its mother, whether or not she joined it in the tomb. This calf's mother had just come into her milk to feed her soon-to-be-born or infant offspring, perhaps for the first time or perhaps in an annual repetition of her life as a dairy cow.

The yearling cow or stirk straddled the boundary between a calf's life of milk and a cow's life of grass. In mobile pastoral communities dwelling in Central Mongolia today,

[74]The term for a yearling cow or stirk in Mongolian is *byaruu* (бяруу: Appendix B, C).

yearling cattle join a herd based on whether they still nurse from their mothers or whether they have been weaned to grazing (Fijn, 2011). This yearling cow may have continued life with a herd of nursing calves and unweaned yearling cattle separate from their mothers and the rest of the herd for most of the day. On the other hand, the yearling cow may have left mother's milk behind, allowing it to join its mother and the adult cattle herd. If male, the yearling cow was of an age to be castrated into an ox or left intact to mature into a breeding bull. Based on its skeletal remains interred in Grave 012, it remains unclear whether the adult cow was the infant calf's mother or not. However, the adult cow had a number of foot bones that suggest particular long-term activities: traction paleopathologies. The kind of physical work and bodily strain undertaken by cattle that pull carts, ploughs, and wagons over long periods of time can lead the bones of their feet to remodel and react in response to the stress and strain.

Let us reassemble the calf, the yearling cow, the adult cow, and the two people buried together in Grave 012. What interpretive possibilities does a *relational osteobiographical approach* to their bodily particularities offer? Let us take Human EA06 and Human EA07 as elusive and incomplete individuals inferred from bioarchaeological analysis and reunite them as those who buried them intended: as a pair together with three cattle. Human EA06 and Human EA07 shift from bioarchaeological constructs into once-living people in a mobile pastoral lifeway connected through cattle as *Saakhalt*[75], the modern Mongolian term for milking partners, or neighbors who live close enough to share daily milking duties. Articulated as *Saakhalt*, this

[75] *Saakhalt* (Саахалт: "milking partners, neighbors", according to Bawden, 1997) is related to the Mongolian verb "to milk" (*saakh*/саах). As *Saakhalt*, this pair of people evokes the way that milk forges interspecies relationships in mobile pastoral communities. Ethnographic accounts among present-day multispecies herding communities in Mongolia specifically discuss a version of *saakhalt* called *saakhilt ail* (see Ahearn, 2021). The *saakhilt ail* arrangement as recounted by Ahearn (citing Undargaa, 2007) is made between two encampments dwelling near each other to send their nursing young livestock to the other encampment to prevent them from drinking their mothers' milk during the day and facilitate dairy production.

pair of people together with cattle evokes the way that milk, specifically from cows, can forge and shape interspecies relationships within mobile pastoral lifeways, such as the modern Mongolian context. We can envision *Saakhalt*'s bodily materialities – the fractures, worn joints, infections, and oral health problems – together with those of the young calf, yearling cow, and adult cow as lived experiences of cow-herder relationships in a mobile pastoral lifeway. They take shape as social beings who lived intertwined, interdependence lives.

Vignettes of collaborative and contentious interactions that contour herder-cattle relationships in a mobile pastoral lifeway, particularly informed by modern and recent historical Mongolian practices, suggest themselves and flesh out the lived experiences of *Saakhalt*, the calf, yearling cow, and adult cow. *Saakhalt* wrestles yearling cattle to the ground during each castration season, back and legs struggling against writhing flanks and lashing hooves. One season, a particularly feisty yearling's hoof connects, breaking *Saakhalt*'s nose. Over a lifetime of calving seasons, *Saakhalt* has worked through numerous difficult births; pulling against the incredible resistance of a large calf in a small birth canal season after season wears down joints in *Saakhalt*'s shoulders and lower back.

Year after year, *Saakhalt* lifts and packs tents, bedding, tools, small children, and the infirm onto the adult cow's cart when it is time for their encampment to migrate with the seasons. Together *Saakhalt* and the adult cow use their bodies to move their home and community across the slopes and plains of Central Mongolia. Sometimes *Saakhalt* must tug the ox forward when the switch and reins won't do the job – a heavy load, a wheel caught on a rock, and tired hooves all working against forward motion – and resort to hauling against this cow's formidable strength with every ounce of core strength. The adult cow is indispensable to the teamwork of moving people and goods by cart or wagon, and has learned the bodily techniques of the role: to stand for yoking, loading, and unloading when asked to stand; to pull the cart or wagon with a steady gait over shifting terrain; to tolerate the squeak of the wheels, the rubbing of the yoke, and the pains in its feet; and to mind the actions and calls of *Saakhalt* and other herders.

The young calf means that a cow has given birth within recent months, if not weeks or day, and is in milk. Thus, the young calf embodies two fundamental activities within cow-herder relationships: calving and milking. The young calf trots to its mother's side on the spindly legs of infancy, a highlight of the daily routine of milking season. *Saakhalt* has just finished a session of massaging and pulling the cow's udders, crouched down and head brushing the cow's wooly side, with practiced hands and strong shoulders to fill a pail with her milk. The young calf noses its mother's udder until *Saakhalt* guides its soft, damp muzzle to a teat. *Saakhalt* lugs the pail brimming with the rich white liquid that will be heated, stirred, strained, molded, dried, and even fermented into fried cream, squeaky curds, tangy yogurt, fresh or hard cheeses, and other dairy foods that will nourish growing, hard-working bones. Even with an increasingly pained mouth, *Saakhalt* relishes creamy yogurt and runny fried cream that are gentle on sore gums.

Saakhalt is generated by a scale of relational osteobiographical interpretation of skeletal remains from a minimum of two human individuals found interred together in one tomb. As we saw above, the lived experiences embodied in the bones and teeth that constitute *Saakhalt* span infection and disease, one-time and repeated physical traumas, intense physical activity/load-bearing/work, and dental disease and oral health likely escalating over some time. *Saakhalt* comprised more than one individual, more than one life, and more than one kind of lived experience. By putting *Saakhalt* back together with the young calf, the yearling cow, and the adult cow with possible traction pathologies – reconstituting the interspecies assemblage as those who first assembled it intended – this second scale of relational osteobiography (the entire interspecies assemblage in the tomb) posits that the kinds of relationships between such humans and such herd animals (in this case, the activities, practices, and events of cow-herder relationships in a mobile pastoral context) offer an intelligible, empirically-grounded, epistemologically-consistent interpretation of the lived experiences made manifest in those bones and teeth.

Saakhalt is so named for the resonance between the cow-herder relationship theme of cattle associated with humans, and for the (culturally-specific) possibility/practice of forging social ties through dairying. As noted above, the practical demands of milking cattle can create and structure relationships, as seen in the term *saakhalt*, which denotes "milking partners" and serves as a traditional term for neighbors in modern Mongolian. Rather than assert that the milking partners and neighbors relationship existed within the Xiongnu community at Elst Ar, in Grave 012 *Saakhalt* denotes the humans paired in a mortuary relationship (relationship in mortuary space) with one another and with cattle to emphasize that we should consider types or forms of culturally-specific interspecies relationships within mobile pastoral contexts.

The second scale of relational osteobiography trucks in relationships created through mortuary practice that work with and through humans and other animals; in this case, the intentional association of *Saakhalt*, the young calf, the yearling cow, and the adult cow with possible traction pathologies. If we accept the arguments that these humans and cattle were deliberately assembled in mortuary space, then the resulting interspecies assemblage is intentional. In the case of Grave 012, it is not a great leap to infer that constructing relationships between *Saakhalt*, the young calf, the yearling cow, and the adult cow constituted a significant component of mortuary practice. We observe that those who buried *Saakhalt* along with the young calf, the yearling cow, and the adult cow constructed relationships between them by intentionally assembling them through mortuary practice. However, we cannot infer that the lived experiences of *Saakhalt* and the cattle discussed above took place as interactions between these five beings. As discussed in the first two relational osteobiographies, it is entirely possible that the two people comprising the pair *Saakhalt* never met, that the three cattle came from three separate herds, and that none of these five beings interacted with one another during their lifetimes. What matters is that their bones and teeth show evidence of lived experiences consistent with these particular kinds of activities and practices, which are components of cattle-herder relationships within a mobile pastoral lifeway. Such bodily engagements constituted and were enacted by those five individuals over the course of their lives.

Moreover, those who assembled the pair *Saakhalt* and the young calf, yearling cow, and adult cow intended them to be together in death. This is the second component of the interspecies assemblage scale of relational osteobiographical analysis that targets the acts of assembling, and thus the intentional nature of the interspecies assemblage in mortuary space. Living people engaged in mortuary practice at Elst Ar and brought together *Saakhalt*, the young calf, the yearling cow, and the adult cow into what we know as Grave 012. Whatever motivated the assemblers, we know that they deliberately associated the two humans and three cattle. The *relational osteobiographical approach* to this interspecies assemblage thus suggests that the assemblers intended to articulate a specific iteration of herd within the Xiongnu mobile pastoral idiom: one constituted by cow-herder, or cattle-human relationships.

8.2.4 Dog' Tolgoi *(4th relational osteobiography – Grave 020)*

A minimum of seven individuals (or their component parts) were assembled into Grave 020: two humans, one horse, one cow, two sheep or goats, and one lamb or kid. At first glance, this interspecies assemblage evokes the second relational osteobiography, where *Khos* joined a cohort of nonhuman animals representing all the five muzzled beasts identified at Elst Ar – horse, cattle, and sheep and possibly goats – in Grave 022. However, a closer look at the osteological specifics that comprise this interspecies assemblage will elucidate the particular relationships constructed by assembling together these once-living beings into the same mortuary context.

Bioarchaeological analyses determined that the human bones and teeth in Grave 020 came from at least two people. As in the case with the other double human burials at Elst Ar, the human remains in Grave 020 were found commingled. The first individual, Human EA12, died over the age of 60 and had a skeletal sex of female. No skeletal indicators of age at death or sex could be determined for the second individual, Human EA13, using the methods deployed in this project. The only "duplicate" element attesting to a minimum of two human individuals in Grave 020 are two right scapulae. Disturbances of Grave 020 obliterated the tomb's original organization in three dimensions, which robs us of contextual data that might indicate how Human EA12 and Human EA13 were interred in relation to one another in time and space.

Human EA12 had a female skeletal sex and died at a minimum of 60 years of age, possibly older[76]. Human EA13 is elusive; their existence is ascertained only by a second right scapula. It is certainly possible that osteological elements assigned to Human EA12 in fact

[76]The 60+ years age-at-death bracket is the oldest possible bracket for the aging methods used in this project (see Appendix H).

belong to Human EA13. The methods for skeletal sex assessment and age-at-death estimation used in this project do not yield useful information on this score: all human skeletal materials identified in the Grave 020 bioarchaeological assemblage are osteologically adult. Because all the human bones and teeth in Grave 020 were found commingled, it is difficult or impossible to correctly identify them as belonging to Human EA12 vs. Human EA13. Taken together, the human remains do not add up to one, let alone two, complete skeletons; many bones and teeth are missing. Let us follow the lead of the previous three relational osteobiographies and shift from discrete individuals to the bodily record of health, activities, and life events writ in the bones and teeth of the two people buried in Grave 020.

Of the remaining bones, signs of hard work and physical strain over long periods of time appear throughout the skeletal system. Worn joints in the hand, left knee, front upper chest (manubrium), and particularly in the back attest to long-term use to the point of degeneration. The developed muscle attachment sites in the legs indicate regular biomechanical loadbearing, or hard work. Overall, in these "unassigned" human remains, we see an iteration of the pattern observed elsewhere in the people buried at Elst Ar: lives of physical labor and bodily engagement with the world around them, rather lives lived in leisure or punctuated by violent traumas.

One entire lower jaw contains evidence of a novel use (at Elst Ar) of the body during life. The human remains from Grave 020 included a single complete mandible from an individual who lost four teeth before they died[77]. The remaining twelve teeth are all worn down on their biting surfaces (occlusal) to the point that enamel gives way to the softer, sensitive dentine

[77]The teeth lost antemortem are the back two teeth on each side (left and right 2nd and 3rd molars) and were lost long enough before death that the empty sockets (alveoli) completely resorbed and the mandibular corpus reduced and remodeled in response.

underneath. Although this wear is heavy on both the left and right sides, the right side exhibits more pronounced wear. The most notable wear occurs on the four incisors. These four frontmost teeth are worn down at a pronounced angle, with the anterior or labial aspect worn significantly lower than the posterior or lingual aspect[78]. Perhaps this individual used their teeth as a "third hand" to grip and anchor, tear and rend, and bite and perforate a variety of materials throughout a productive life. The extent of wear and loss of teeth during life are consistent with Human EA12's being an elderly individual, but this lower jaw may have belonged to the elusive Human EA13. Overall, this lower jaw is a record of a person who suffered from but survived dental problems (in the form of lost teeth with successfully-resorbed alveoli) and used their teeth heavily, perhaps for specialized purposes beyond eating.

Given the difficulties in reconstructing Human EA12 and Human EA13 as fully realized, discrete individuals, let us follow the path set out in the previous three relational osteobiographies and place Human EA12 and Human EA13 in context. That context is with the remains of five domesticated herd animals, as intended by those who buried them together. From one perspective, Grave 020 yielded representatives of all domesticated herd animals identified in the Xiongnu mortuary assemblages from Elst Ar: horse (*Equus* sp.), cattle (*Bos* sp.), and sheep/goat (*Ovis*/*Capra*[79]). Unlike in Grave 001 (*Akhmad*) and Grave 022 (*Khos*), no bones or teeth belonging to *Ovis aries* were identified in Grave 020. The overall number of individuals whose bodies (or body parts) went into Grave 020 is markedly lower than the counts for Graves 001 and 022. How might we evaluate the overlaps and departures in "whole herd" interspecies assemblages at Elst Ar?

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[78]Further analysis may yield more evidence about the causes of occlusal wear in these and the other mandibular in situ teeth from Grave 020.

[79]Appendices C and D discuss the distinctions between sheep (*Ovis aries*) and sheep/goat (*Ovis/Capra*; *bog mal*) in cultural taxonomies and zooarchaeological methodologies.

Grave 020 is a specific iteration of the full nonhuman herd animal complement present in the Xiongnu mortuary assemblages from Elst Ar. In comparison to the "whole herd" interspecies assemblages from the first and second relational osteobiographies (Graves 001 and 022), markedly fewer individual animals (or their component parts) joined Human EA12 and Human EA13 in death. The domesticated herd animals from Grave 020 include an adult horse, a subadult cow, two sheep or goats, and a lamb or kid that died before 6 months of age. Evidence from what remains of the horse's skeletal system suggests that it died before reaching 4.5 years of age, but a more careful interpretation is of an adult horse who died at an indeterminate age. This horse's left first rib displays histological reaction that indicates survival of infection for enough time for the bony tissue to physically react. The single cow[80] died at an indeterminate age, but while its skeletal system was still developing. The cow also survived an infection in its left shoulder for that bony tissue to manifest a histological reaction. Like the horse, the developing cow died before their infected bone could fully fight off infection and heal. The two sheep or goats were skeletally adult and died at indeterminate ages. The third *Ovis/Capra* individual was a lamb or kid who died before six months of age.

From one perspective, these five individual herd animals embody a microcosm of the multispecies domesticated animal herd at the heart of modern Mongolian mobile pastoralism and that seems to have been true for the Xiongnu at Elst Ar as well. On the other hand, these were unique individual animals even if they were meant to stand in for something more general. Their bodily particularities are highlighted by the signs of infection seen in the horse and the cow. The growing lamb or kid was born to a specific ewe or doe[81]. The growing cow belonged to a

[80]This individual was assessed by zooarchaeological methods used in this project to be *Bos* sp., which in this context encompasses cow, yak, and their various hybridizations.
[81]Grown female goats are variously called nanny goats, nannies, and does in English (see Appendix B).

specific herd in life. The sheep or goats were cared for by specific herders. The horse grazed in specific pastures. Irrespective of whether these five animals belonged to the same herd and herders in life, they were born and lived their lives embedded within relationships between specific herders and other herd animals. Perhaps these five animals were at some level interchangeable objects or symbols used during Xiongnu mortuary practice. However, if we consider that the horse, the growing cow, the two sheep or goats, and the lamb or kid were social beings with life histories and dynamic roles within a mobile pastoral group or community, we can hypothesize the kinds of lived and constructed relationships that characterized them.

In putting the interspecies assemblage of Grave 020 back together, we transform what we learned from the teeth and bones of beings buried together into the bodily activities, events, and interactions of herders and herd animals who lived interdependent lives in a mobile pastoral context. From all the bones and teeth that belonged to Human EA12 and Human EA13, we can identify lived experiences of hard physical labor over significant time periods that likely occurred through a variety of activities, events, and practices. An elderly woman has lived to relative long life, accruing mobile pastoral expertise that spans the array of herd animals over her many years. We may hypothesize that both herders worked with, cared for, and handled the full complement of herd animals in their lived experiences of a mobile pastoral lifeway, as they were placed together with them in their mortuary context: horses, cattle, sheep, and goats. Together we may interpret the elderly woman and the second herder as *Dog' Tolgoi*, translating to "old hand" in modern Mongolian[82].

The human activities embodied in Grave 020's interspecies assemblage suggest more specific practices undertaken by the herders interred therein. When *Dog' Tolgoi* processes the

[82] *Dog' Tolgoi* (догь толгой) "an old hand" (Bawden, 1997). ***Dog'*** (догь) alone means "seasoned", "experienced" (ibid). See Appendix A for pronunciation of ***Dog'*** (DOY-g).

hides of their cattle, generation after generation raised and tended by them, they grip the fresh skin in their teeth and scrapes off the viscera and fat with expert flicks of the wrist. Their hardworking teeth have become sensitive, years of leather processing and fiber crafts wearing down their surfaces, but *Dog' Tolgoi* continues their craft and disseminates it to younger herders. *Dog' Tolgoi*'s strong legs develop from years of following flocks of sheep and goat that lead a merry chase over rocky hills and rolling plains, of standing tall and balanced in the saddle as their horse gallops across the steppe, and of striding behind the cattle to walk them home for milking. Bodily hauling sheep and goats to the ground for slaughter, gripping reins and lead lines, wrestling young cattle to the ground for castration, and staying in the saddle or being thrown from it have worn down joints in *Dog' Tolgoi*'s hands, chest, left knee, and back over years and seasons.

While the above narrative centers *Dog' Tolgoi* – the elderly woman with heavily-worn teeth and the enigmatic other person in Grave 020 – herd animals are indispensable to it. As in previous relational osteobiographies, these specific herders and herd animals did not have to live together or interact during their lifetimes. The Xiongnu who assembled them together in Grave 020 asserted relationships between these people and domesticated herd animals drawn from the material, bodily results of the lived experiences of human-animal relationships that characterized the elderly woman, the second person, and five herd animals.

8.2.5 Khaikhramj *(5th relational osteobiography – Grave 021)*

The interspecies assemblage recovered from each of the eight Xiongnu graves excavated at the Elst Ar cemetery includes one or two people and a cohort of domesticated herd animals.

Grave 021 is the only one of these eight graves where the humans outnumber the herd animals. A minimum of three individuals comprised the interspecies assemblage from Grave 021 at Elst Ar: two humans and a sheep who died between two and four years of age. While zooarchaeological methods cannot ascertain definitively that only a single nonhuman animal to the exclusion of any other individual animals or their component parts was interred in Grave 021, those methods yielded no positive evidence for more than a single sheep. What do we make of an interspecies assemblage dominated by human remains?

Bioarchaeological analyses of Grave 021's human remains (see Appendix I) indicate that Human EA14 was a skeletally-female individual who died over 49 years of age, and that Human EA15 was an individual of indeterminate sex who died between 18 and 21 years of age. Human EA14 may have been significantly older than 49 when she died, as the available empirical evidence did not support a cutoff or ceiling for her age-at-death estimation. No pelvic girdle or cranium (besides the lower jaw bones) was found for Human EA15, leaving scant material upon which to apply the skeletal sex assessment and age-at-death estimation methods used in this project. The marked disparity in Human EA14 vs. Human EA15's age-at-death estimates provides some basis for differentiating the bones and teeth that belonged to one individual rather than the other.

Both Human EA14 and Human EA15 left behind their complete lower jaws. Despite the significant gap in their ages at death, both had oral health problems. Both people lost some of their permanent teeth before they died. Their lower jaws are marked with signs of infection in empty and resorbing tooth sockets. However, the older woman's problems appear more pronounced; her lower jaw contains more empty tooth sockets and even a full-blown abscess in one case. Human EA15 died as their wisdom teeth were coming in, but had already lost some of their permanent teeth, perhaps to disease or (less likely) trauma. The loss of permanent teeth was likely the culmination of unpleasant, even painful processes: a cavity leading to a rotted tooth, which was either pulled or came loose as it decayed, and an open tooth socket (alveolus) where food could become trapped and microbes could quickly enter the bloodstream. Yet aside from these two lower jaw bones, the human remains from Grave 021 show no obvious signs of infection.

Although is largely absent from the human remains in Grave 021, other signs of discomfort and pain appear in these bones. The older woman likely lived for some time with impairment to her mobility and a level of pain, due to the pathological contacts (false joints) between her sacrum and left and right ilia. If this condition sounds familiar, it is because Human EA16 of *Khos* from Grave 022 (the second relational osteobiography) showed a similar state of collapsed lower back partially fallen onto the pelvic girdle. Signs of hard living – regular, long-term biomechanical loading and strain – manifest throughout the human bones not readily identifiable to the older woman or the young adult. Schmorl's nodes, bony growths (exostoses), and other signs of joint degeneration mark the vertebrae. Some of this joint wear and degeneration is mirrored in the ribs, which would articulate with some of these vertebrae in life. One individual's left knee joint showed some arthritis. The bones recovered from Grave 020 that comprise a single left knee also show signs of joint degeneration. We see in the bones and teeth of Human EA14 and Human EA15 a dynamic of work and care manifest in human remains interpreted in the first, second, and third relational osteobiographies.

The co-occurrence of physical toil and strain with a level of support and material care that enabled people buried at Elst Ar, including in Grave 021, to survive infection, injury, and other health problems is evident in what remains of their physical bodies: bones and teeth. As the human element of Grave 021's interspecies assemblage, Human EA14 and Human EA15 present an informative exception to the other double human burials at Elst Ar, in that both their ages at death can be estimated with the available data. Human EA14 was more than twice Human EA15's age when both died and were placed in Grave 021 along with a single sheep.

The interspecies assemblage of Grave 021 is unusual compared to the others analyzed from Elst Ar as the only one in which humans outnumber nonhumans. A minimum of one nonhuman animal was identified from the interspecies assemblage from Grave 021: a single sheep whose skeletal system was still growing and developing when it died. This sheep died between two and four years of age, and thus would have reached sexual maturity before it died. Despite being an osteological subadult, this sheep had aged out of the "hogget"[83] category, and may not have been considered "culturally" subadult. In modern Mongolian mobile pastoral contexts, a sheep of this age would be in its productive prime (see Fijn, 2011). As an ewe, it would be of age to breed and bear lambs. As an intact male, it could serve as a breeding ram or tup. As a castrated male, it would make for prime meat based on its age.

When we reconstitute the interspecies assemblage at the heart of Grave 021, we reunite the older woman, young adult, and 2- to 4-year-old sheep placed together as those who buried them intended. What remains of their three bodies suggest care and support, regular physical exertion over an extended period of time, and (re)productive prime. As an assemblage, they may be conceptualized as *Khaikhramj*, a modern Mongolian word denoting attention, consideration, and care (Bawden, 1997). That the two herders survived multiple oral health problems long enough for their bones to react and sometimes heal implies that they received material care and social support. In a similar vein, the extreme scoliosis of the older woman's lower back likely

[83]A hogget is a domesticated sheep (*Ovis aries*) in its second full year of life (see Appendices B, C).

caused her pain and reduced her mobility. To survive such a condition as long as she did, the older woman would need assistance from others to meet her physical needs. The signs of strain and loadbearing manifest in the worn joints throughout the human vertebral column and single left knee consistent with a life of toil and labor. Finally, the sheep appears to have been in its physical prime by modern Mongolian mobile pastoral reckoning. Such a life results from care and effort on the part of others, human and nonhuman animal work, and the being's own biological functions. Moreover, a sheep in its prime for breeding and eating is a herder's success story; such an animal survived into adulthood thanks to the care, management, and companionship afforded it by herders and other herd animals. Recalling that those whose mortuary practice created Grave 021 chose to construct relationships between the older woman, the youth, and the sheep, it is intriguing to suppose that those assemblers or practitioners intended to associate these materially-manifested dynamics of mobile pastoral life.

8.2.6 Mal Tuugch *(6th relational osteobiography – Grave 013)*

The remains of four individuals were recovered from Grave 013: a person who died between 30 and 35 years of age (Human EA08), one cow, one sheep or goat who died before 2.5 years of age, and one lamb or kid who died before three months of age. Human EA08 derives from the bioarchaeological analysis of poorly-preserved elements that constitute a partial skeletal system. The state of these human skeletal remains present significant epistemological challenges, as their incomplete nature and poor preservation may obscure indicators of osteobiographical details that would be evident in these materials under better preservation conditions.

Despite these challenges, the bioarchaeological methods used in this project identified empirical bases for a number of osteobiographical qualities that comprise Human EA08. First, Human EA08 appears to have died between 30 and 35 years of age. Second, Human EA08 experienced at least one physically traumatic incident, fracturing a rib that healed before death. Third, Human EA08 engaged in regular, long-term biomechanical stress and loadbearing in their spinal column, with signs of degenerative joint disease throughout their vertebra. Fourth, Human EA08 suffered from some infection in their left hip joint, as the bony tissue of their left femoral neck responded to microbial infection over enough time to physically remodel. Fifth, Human EA08 presents an ambiguous skeletal sex due to both poor preservation of skeletal remains and contradictions between the few sex-linked traits of the pelvic girdle that did survive those taphonomic processes (see Appendix J).

Rather than focusing on what we do not know about Human EA08, attending to the human remains themselves produces suggests a person whose spinal column bore the brunt of biomechanical loading and use wear over a significant period of time, who survived at least one physically traumatic event, and who died while still fighting some kind of infection in their left hip. Aside from the vertebral column, what remains of Human EA08's skeletal system displays relatively few signs of degenerative joint disease. Human EA08's lower jaw shows no signs of poor oral hygiene or teeth lost before death. While these observations suggest that Human EA08 enjoyed reasonably good health, the poor preservation of their remains place us in on challenging epistemological terrain. Perhaps Human EA08 experienced few worn joints, healed traumas, and infections; perhaps these bodily experiences have been largely obliterated by taphonomic processes in Grave 013. We are on firmer ground when analyzing the signs of degenerative joint disease, physical trauma, and infection that can be observed in Human EA08's bones.

Like others buried at Elst Ar, what remains of Human EA08's body indicates a life lived in absence of violent trauma. The single indicator of trauma is a healed left rib fracture; when understood in relation to the worn and degenerating joints of Human EA08's spine, such trauma is more consistent with the falls and presses of rough-and-tumble activities than the stabs and crushing blows of violent interpersonal conflict. No likely cause of death could be found in Human EA08's bones. In isolation, it is extremely difficult to hypothesize the activities, events, and practices that shaped Human EA08's bones as we now encounter them. However, by using the relational osteobiographical approach, we have the advantage of reconstituting the intended context in which Human EA08: as part of an interspecies assemblage.

Three herd animals accompanied Human EA08 into the grave: one cow and two sheep or goats. The cow died as an adult, with no evidence that its skeletal system was still developing. Although no skeletal indicators of the cow's sex or age at death were identified, zooarchaeological analysis found potential evidence of particular activities the cow undertook during its lifetime. Changes in some bones of the cow's feet may indicate that this cow pulled carts, wagons, and/or ploughs regularly during its lifetime. These bony changes appear similar to what previous zooarchaeological research terms "traction paleopathologies"[84] that result from specific biomechanical loadbearing within pulling activities by the animal (cattle being the most widely studied and observed in zooarchaeological literature). This adult cow's remodeled feet are not the only examples of potential traction pathologies in cattle identified from the interspecies assemblages at Elst Ar. The third relational osteobiography that interprets the interspecies assemblage from Grave 012 at Elst Ar recounts an analogous case, where the adult cow that joined *Saakhalt* and other cattle in that mortuary context displayed similar changes in

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[84]Appendix J discusses this cow's potential traction paleopathologies. Appendix G provides a more detailed explanation of traction paleopathologies in cattle in general.

some of its foot bones. Yet such potential traction pathologies do not appear in all interspecies assemblages from Elst Ar that include adult cattle foot bones[85].

The two sheep or goat individuals were still growing and developing when they died. The kid or lamb was quite young when it died, not yet having reached three months of age. Such a kid or lamb would be dependent on its mother for sustenance, although perhaps just starting to graze. The sheep or goat died before reaching two-and-a-half years of age. Dying midway into its third full year of life, the sheep or goat was of an age to have already been bred or castrated.

When reassembled, the interspecies assemblage of Human EA08, the adult cow with possible traction paleopathologies, the very young lamb or kid, and the growing sheep or goat evokes a set of relationships between herders and herd animals particular to what is left of these bodies. Human EA08 becomes *Mal Tuugch*[86], or Drover, one who drives cattle, sheep, and goats in pastoral contexts. *Mal Tuugch* walked and rode behind herds of cattle, goats, and sheep in their daily and seasonal peregrinations over hill and through dale. Their fast-paced treks after sure-footed sheep and goats has taken on a new burden now that their left hip pains them, but slowing down or abandoning their droving are not options. *Mal Tuugch* goaded oxen along rutted paths, spine rattling in the wagon's seat or bent double to haul recalcitrant oxen forward season after season, year after year. *Mal Tuugch* has been caught in the crush between cattle more than once at the price of a fractured rib.

Previous relational osteobiographies discussed why it is unimportant whether *Mal Tuugch* undertook such activities and events with the adult cow, growing sheep or goat, and

[85] Although *Bos* sp. first, second, and/or third phalanges were identified in Graves 001 (first relational osteobiography: see Appendix E) and 022 (second relational osteobiography: see Appendix F), no traction paleopathologies were observed in either zooarchaeological assemblage.

[86] *Mal Tuugch* (Мал Туугч), meaning "drover" or one who drives livestock in modern Mongolian, is a composite of *mal*, the word for animal in the sense of livestock, and *tuugch*, which is often translated as "teamster" or "goadman" (Bolorsoft LLC, n.d.).

young lamb or kid in life; what is significant is that such interspecies interactions are consistent with what we learn about *Mal Tuugch*'s bones. This holds true for the herd animals as well. The adult cow pulled carts and wagons, its cloven hooves digging into the grassy steppe to heave its loads forward by the force of its substantial bulk. Not all cattle are suited to traction. The adult cow possessed the tractable temperament needed to undergo training to the yolk or harness, lead line and reins, and close handling by herders. Its feet are increasingly sore, as they bear the brunt of the forward loadbearing to which the adult cow has become accustomed.

In the course of its short life, the lamb or kid was licked clean by its mother after emerging into the world, lifted by strong hands and tucked under steady arms, nuzzled and butted by its fellow lambs and kids penned together away from the rest of the flock for their safety and mothers' convenience, and nourished by its mother's milk. The sheep or goat who died before reaching two-and-a-half years of age had matured through the stage of development that its companion lamb or kid would occupy for all time. The sheep or goat survived through at least a full calendar year as a growing member of its flock, thanks to the herders who literally shepherded it from birth through its time as a vulnerable lamb or kid to a young adult animal of age for breeding, castration, or consumption.

8.2.7 Achigch *(7th relational osteobiography – Grave 015)*

A minimum of five individuals, or their component parts, were interred together in Grave 015: one human of indeterminate skeletal sex and unknown age at death, two cattle, and two sheep or goats. The person in Grave 015's interspecies assemblage lived a physically-demanding life and joins four nonhuman animals, three of whom died as skeletal subadults.

The human skeletal remains were poorly preserved, degraded, and incomplete by the time archaeologists excavated Grave 015 at Elst Ar. The traits and features of the human skeletal system needed to assess skeletal sex and to estimate age at death using this project's methods were obliterated, obscuring these sociological aspects of Human EA018. The partial and degraded nature of the skeletal remains that are constructed into Human EA018 hinder paleopathological identification. The analyst cannot ascertain that physical trauma, infection, disease, and nonstandard osteological morphologies did not appear in Human EA018's skeletal system. However, despite these challenging epistemological conditions, bioarchaeological analysis did identify extensive and often extreme signs of heavy, long-term biomechanical stress and load-bearing in what remains of Human EA018's skeletal system (see Appendix K).

These bony indicators of heavy workload and use are particularly extreme and evident in what remains of Human EA018's vertebral column: from the upper neck to the base of the spine, in the joints between vertebrae, and at many points where the ribcage articulates with the spine. Human EA018's spine also asymmetrical. Towards the base of the spine, the vertebral column develops scoliosis, canting right from the midline as the lower vertebral bodies increasingly compress in form. This rightward slant culminates in the fifth lumbar/final vertebra forming a false joint with the sacrum in the pelvic girdle. Human EA018 lived with the long, gradual collapse of their lower spine onto itself that likely caused increasing pain, if not reduced range of motion and mobility.

Signs of physical hard work over a long period of time appear elsewhere in Human EA018's skeletal system. Together with the vertebral column discussed above, the entire chest and the upper limbs display signs of extreme degenerative joint disease. The shoulders in particular show bony remodeling and wear highly suggestive of extreme degeneration. The wear and degeneration seen in the upper limbs and shoulders are not the only signs of hard work in Human EA018's upper body. Robust, pronounced muscle attachment sites appear on both upper arms, consistent with major biomechanical loadbearing over time. However, these muscle attachment sites are most notable for their unusual positioning[87], which may be related to the extreme degeneration observed in the shoulders. Signs of joint degeneration appear in what remains of Human EA018's legs as well.

In addition to physical work, Human EA018's skeletal system bears evidence of physical trauma. Human EA018 survived at least one event, if not multiple events, that broke numerous ribs near where they join the spine and a bone in one finger. Although Human EA018 survived such trauma, none of these broken bones were sufficiently stabilized to heal properly. This suggests that Human EA018 maintained a level of activity and movement throughout the healing process antithetical to letting the bones properly reknit. Taken holistically, the skeletal remains that comprise Human EA018 provide a record of hard work and physical trauma. While the specific worn joints and injuries vary, Human EA018 is part of a pattern seen in other human remains at Elst Ar, where long-term physical work or loadbearing coexists with physical trauma. Human EA018 the bioarchaeological construct embodies a life of hard work peppered with physical trauma. We can transform Human EA018 into a social being, a person who lived a life interconnected with others, when we place Human EA018 in the context that those who buried them intended: together with four herd animals.

At least two cattle and at least two sheep or goats were assembled together with Human EA018 into Grave 015 by the Xiongnu at Elst Ar. Of these four herd animals, at least three died

[87]The greater and lesser tuberosities of each proximal humerus appears in a more anterior position than is observed within standard human variation. These muscle attachment sites almost look as if they were "pulled" anteriorly. Moreover, they are more rugose and larger than average greater and lesser tuberosities in the human humerus.

while their skeletal systems were still developing. The two cattle died at indeterminate ages, but their bones were still growing at the time of their deaths. One of the sheep or goats died before it reached the 12-18-month age range. The other died over 12 to 18 months of age, which only indicates that this sheep or goat was no longer a lamb or kid. A single bone[88] from the foot of one of the sheep or goats is marked with bony growths on multiple surfaces, suggesting degenerative joint disease and/or biomechanical loadbearing in at least one foot. This would be consistent with an active, physically-demanding life for the sheep or goat in question.

Although Human EA18 died at an indeterminate age, their skeleton records regular, long-term physical exertion punctuated by at least one traumatic event that resulted in broken bones. When reconstituted into an interspecies assemblage with the two cattle and two sheep or goats, Human EA18 transitions from a bioarchaeological construct to a social being: *Achigch*[89]. The appellation *Achigch* highlights the literal biomechanical loads borne by Human EA18 during their lifetime. By returning *Achigch* to the context intended by those who assembled the interspecies assemblage at the heart of Grave 015, the strenuous work that *Achigch* undertook can be interpreted as bodily engagements within a mobile pastoral lifeway.

8.2.8 Bairtsgüi *(8th relational osteobiography – Grave 004)*

Grave 004 yields an interspecies assemblage that presents the most heightened challenge to the relational osteobiographical approach. A minimum of two individuals – one human, one nonhuman – comprised the assemblage, but only two bony fragments indicate the presence of the

[88] Second or intermediate phalange
[89] *Achigch* (Ачигч) translates to "loader", "porter", or "baggage-handler" in modern Mongolian (Bawden, 1997; Bolorsoft LLC, n.d.).

nonhuman animal. So little of the nonhuman animal remains behind in Grave 004 that the once-living being is nearly unintelligible in archaeological interpretation. In light of the previous seven relational osteobiographies and the Xiongnu mortuary contexts from which they are generated, the association of Human EA04 and this unknown animal was intentional on the part of those who assembled them together in Grave 004. While so little can be inferred about one constituent of an interspecies assemblage, the human element emerges in detail.

Human EA04 was a skeletally-female individual who died over the age of 50. Her skeletal remains provide fertile soil for bioarchaeological methods used in this project to assess skeletal sex, estimate age at death, and analyze paleopathological indicators of trauma, disease, and so forth. In contrast, the nonhuman animal of Grave 004 eludes characterization. Its remains are few and fragmentary: literally two rib fragments (see Appendix L). In contrast to the older woman it joined in Grave 004, this nonhuman animal left behind very little for archaeologists to uncover. Thus, very little can be extrapolated this animal and its lived experiences. Yet those whose mortuary practices generated Grave 004 intentionally paired this animal with the older woman.

Skeletal indicators of how Human EA04 lived her life appear throughout what remains of her body. Muscles in her upper arms developed through biomechanical loading over time, indicative of regular physical labor or exertion. Generalized reaction of living bony tissue that often indicates microbial infection appear throughout her skeletal system: at her ear canals, eyebrows, upper jaw, both hands, left hip joint, and both feet. Joint surfaces in her spine, upper chest and shoulders, elbows, hip joints, hands, and feet exhibit signs of wear at varying levels of severity. Wear of Human EA04's durable biological matter was not confined to her joints. She had heavily worn lower incisors, not entirely dissimilar to the elderly woman buried in Grave

021, although not the marked angling seen in Grave 021's elderly woman. Human EA04 suffered through many health problems in her mouth: she lost numerous permanent teeth from both her upper and lower jaws before she died. Those teeth that remained were coated in hardened dental plaque and worn on their biting (occlusal) surfaces. As a result of lost lower teeth, the older woman's lower jaw remodeled, reducing in its robusticity and size without teeth to hold the living bony tissue to its intended shape. Human EA04 thus lived through a long period of poor oral hygiene and dental health that likely caused her discomfort and pain.

Taking the above osteobiographical features of Human EA04 holistically, she emerges as a woman who lived a relatively long life of physical work punctuated by infection and a mouth that increasingly pained her. These factors suggest that this older woman engaged actively and regularly with the world around her, including other living beings. The limited information about the other constituent of Grave 004's interspecies assemblage impedes our abilities to interpret the kinds of human-animal interactions in life that might shed light on Human EA04 and its intentional association in death. Together Human EA04 and the nonhuman animal remains constitute *Bairtsgüi*[90], named for how the assemblage eludes the analyst's interpretive capacities. However, *Bairtsgüi* comprises an intentional association of human and nonhuman. We may hypothesize this by extrapolating from the previous seven Xiongnu tombs at Elst Ar and the relational osteobiographies generated from their interspecies assemblages. Those who enacted the mortuary practice that resulted in Grave 004 constructed a relationship between the two once-living beings. In the context of the other interspecies assemblages at Elst Ar, the

[90]Барьцгүй is a modern Mongolian word for 'elusive, hard to grasp' (Bawden, 1997), generated from the root word барьц (*bairts*). Барьц has two meanings: 1) 'grip, grasp', and 2) 'offering, alm'. While *Bairtsgüi* as the relational osteobiography's title draws predominantly on the first meaning of барьц, the second meaning is not out of place in describing bodily remains deposited in the course of mortuary ritual.

association of Human EA04 and the unknown animal implies a concern on the part of those who buried them together with assembling human and nonhuman together in death.

8.3 Concluding The Elst Ar Relational Osteobiographies

These eight relational osteobiographical accounts of life and death in a Xiongnu mobile pastoral context are not the only relational osteobiographies possible. Parallel to an assemblage as fluid, contextual, and heterogenous rather than fixed and total, a relational osteobiographical account is one perspective among valid alternatives. Another set of eyes would weave different relational osteobiographies from the same living materiality taken from the Xiongnu cemetery at Elst Ar. But these eight relational osteobiographies are rooted firmly in the empirical: the bodily details of what remains of once-living social beings who constituted the social world at Elst Ar. Certain themes or logics thread through the Elst Ar relational osteobiographies as drawn from the bones, teeth, and horncore interred in each tomb: hard work, expertise, care, and bodily transformations. But these themes are not universal to the Elst Ar multispecies mortuary assemblages, as reflective of the variability in the constellations of humans and domesticated herd animals assembled into each tomb. The performative, declarative character of these assemblages shines through the relational osteobiographies, but what might the Xiongnu at Elst Ar have been enacting again and again through their mortuary rituals?

CHAPTER 9

CONSTITUTING A RELATIONAL, MULTISPECIES BODY-POLITIC: THE PASTORAL FOLD AND ITS IMPLICATIONS FOR XIONGNU SOCIO-COSMOLOGIES AND IMPERIAL POLITICS

9.1 Introduction

After spinning out lived experiences and constructed relationships from intentional assemblages of bones, let us investigate how these assemblages of bones came to be. This returns us to the Xiongnu tombs and the social acts that produced them. These assemblages are the result of intentional, meaningful social action: mortuary ritual and the production of mortuary space. Mortuary ritual and space are loci of deep significance and meaning in a given society, being saturated with heightened cosmological, political, and symbolic valences of that society. As established previously, living Xiongnu selected and assembled the bodily remains of humans and domesticated herd animals through mortuary ritual and interred them together in their tombs across the temporo-geographic span of their empire. Osteobiographical analysis of eight sets of human and nonhuman animal remains from Xiongnu tombs at the Elst Ar cemetery generated bodily details of their lives found in their skeletal systems; relational osteobiographical analysis generated eight tableaux or narratives based on the intentional associations between the bodily remains of these specific people and five muzzled beasts that were constructed by living Xiongnu through mortuary ritual at Elst Ar. Each constellation of herd animals and humans resulted from the performance, assertion, enactment of how those living Xiongnu thought those particular social beings *ought to be* and *ought to be together*. Thus, each multispecies mortuary assemblage is a set of material claims about the right ordering of the social world and the interrelationships that comprise its organization (Fowles, 2013: 151).

This project posits that the Xiongnu production of multispecies mortuary assemblages – bringing humans and herd animals together again and again into multispecies assemblages, but varying the specifics of those multispecies assemblages – is consistent with how mobile pastoral communities organize their members. These variable multispecies assemblages at Elst Ar are reminiscent of herds. The variable, fluid content of the multispecies assemblages from Elst Ar mirrors the variable and fluid character of herds within mobile pastoral societies. In colloquial usage, the term 'herd' broadly describes a nonhuman social group. But in the context of mobile pastoral lifeways, envisioning a herd as solely comprised of livestock is misleading and incomplete: each iteration of herd, each assemblage-in-flux, of necessity involves humans. Because this project articulates the human and livestock remains as intentional assemblages constituted in mortuary ritual, this ubiquitous component of Xiongnu mortuary practice is analogous to the realities of multispecies social organization and connection documented in Mongolian and Siberian mobile pastoral communities.

I propose 'pastoral fold' in the place of 'herd' because it assembles human herders and herd animals together. The togetherness of herd animals and their herders accords with the argument that mobile pastoralism is a multispecies endeavor and the observation of human and herd animal remains consistently interred together in Xiongnu tombs. Each iteration of the pastoral fold is organized around particular kinds of multispecies entanglements (human-herd animal relationships) in a mobile pastoral lifeway that are embodied in these specific humans and herd animals from the perspective of the Xiongnu who buried them together.

I have extrapolated the pastoral fold as a concept or logic within Xiongnu society at Elst Ar from the eight relational osteobiographies, the iterations of which demonstrate values asserted and contested through mortuary ritual that are drawn from mobile pastoral lifeways. I argue that the pastoral fold represents a logic by which a local Xiongnu community assembled and asserted a form of collective identity or subjectivity central to their social order and socio-cosmological commitments. That collective identity was multispecies, relational, and contextual. From this argument I will venture further from the empirical basis generated in the relational osteobiographies to speculate on how the pastoral fold might interdigitate with other scales of Xiongnu politic life. In particular, I tentatively hypothesize that the pastoral fold may have been a mechanism by which political communities came together and scaled up into the Xiongnu imperial polity, and that membership in a pastoral fold was a core component of Xiongnu political subjectivity rooted in potent beliefs and values rooted in mobile pastoralism.

9.2 Variation Was to Be Expected: The Overall Pattern of Xiongnu Multispecies Mortuary Assemblages

Archaeological investigation of Xiongnu mortuary contexts since the earliest excavations of monumental platform tombs in southern Siberia and northern Central Mongolia has documented the widespread Xiongnu phenomenon of intentionally assembling livestock (or their constitute parts) into tombs where human remains were also interred (see Chapters 3 and 4). Archaeologists have argued from these data that the Xiongnu themselves viewed the relationships or entanglements of human herders and their herd animals as central and potent, and enacted their ideological significance in their mortuary practices (Dorjsüren, 1961; Batsaikhan, 2003; Törbat, 2004; Miller et al., 2018).

Furthermore, archaeologists who specifically investigated this phenomenon have asserted that "[d]emonstrable inter- and intra-cemetery variation exists between species, the number of animals, body-part representation and spatial placement within graves" (Miller et al., 2018: 1314). Zooarchaeological analyses of tomb-scale Xiongnu mortuary assemblages from three archaeological landscapes in the Xiongnu imperial core – Burkhan Tolgoi at Egiin Gol, Gol Mod 1, and Baga Gazryn Chuluu – provide empirical support for this argument. However, the function and meaning of the overall pattern (deliberate deposition of herd animal remains in tombs) and the observable variability within the enactments of that pattern (each zooarchaeological assemblage from a Xiongnu tomb) remain undertheorized. Thus, previous research has established that the Xiongnu consistently buried nonhuman animals (particularly the five muzzled beasts, or domesticated livestock of present-day Mongolian mobile pastoralism) together with people, and that both the contents and structures of those associations varied within and between cemeteries within the imperium.

Not widely investigated within Xiongnu mortuary datasets are linkages or correlations between these livestock and the people in whose tombs they were buried. A 2004 monograph produced by the Mongolian archaeologist Tsagaan Törbat may be considered an important exception; Törbat compiled basic data on mortuary contexts and their contents from previously-excavated Xiongnu ring-tomb cemeteries[91], which included information about both the human and nonhuman animal remains recovered from them when available to him (2004) discussed above strongly indicates variety in the basic components of these human-nonhuman animal assemblages along the lines of minimum number of individuals interred (both human and

[91]The Xiongnu cemeteries of Khudgiin Tolgoi, Naimaa Tolgoi, **Burkhan Tolgoi**, Khanan Khad, Khünkheriin Am, Khirgist Khooloi, **Baga Gazryn Chuluu**, Tevsh Uul, Tarvagatai, Khüüshiin Khötöl, Chandman Uul, Baruun Khairkhan, Sul Tolgoi. **Bolded names** indicate Xiongnu cemeteries with tomb-scale nonhuman animal assemblages subjected to zooarchaeological analyses (see Chapter 2).

nonhuman), human skeletal sex and estimated age-at-death, nonhuman animal body-parts, and nonhuman taxon representation. Although not the focus of Törbat's analysis, the associations of livestock and human remains in Xiongnu tombs contributed directly to the formation of the current project. I reframed these data as potential evidence of a Xiongnu preoccupation for assembling together humans and herd animals – the beating heart of mobile pastoral lifeways – again and again in mortuary practice and space.

This reframing rests on re-articulating the once-living social beings, especially the herd animals, as their once-intact sociobiotic selves. The herd animal bodies of each multispecies mortuary assemblage required the lives of those herd animals, even if only parts of their bodies went into the tomb. The horse had to die for its skull (only) to be placed in the tomb, and it was a particular horse with a particular life-history embedded in a network of interspecies material relationships. Although I contend that it is productive to conceptualize the nonhuman animals, together with the humans, in the Xiongnu tombs at Elst Ar in relation to one another as whole animals (whole, living animals, whose bodies or body parts were assembled into each tomb), I acknowledge that this approach may obscure other forms of interpretation and lines of inquiry that might shed important light on Xiongnu mortuary practice. For example, even though a living horse had to be killed for funerary participants to place its skull in a tomb, it might be (and likely was) highly significant that only the horse's skull and not the entire horse (or other of its body parts) was intentionally interred in that tomb. This issue will receive more attention in subsequent passages. By the reframing of body parts into the material bodies of once-living social beings assembled into relationships through mortuary ritual, I posited that analyzing their remains to generate specific osteobiographical details could reveal information about their lives (as materially mediated interspecies interactions) and could help elucidate logics driving the overall Xiongnu pattern of assembling humans and herd animals in their mortuary practice.

9.3 Why Look Closely at Multispecies Mortuary Assemblages?

Before even encountering the Elst Ar multispecies mortuary assemblages, I planned to closely examine human and nonhuman animal remains associated in Xiongnu tombs in order to identify patterns of association between herd animals and people within the broader Xiongnu practice. Building off of previous research, publications of other archaeologists, and my own experiences excavating Xiongnu ring tombs and analyzing the human and nonhuman animal remains they contained, I surmised that the osteobiographical details (species or taxon; age-at-death; skeletal sex; minimum number of individuals [MNI]; and perhaps bodily state in terms of paleopathological indicators) of those once-living social beings would reveal patterns of association between people and five muzzled beasts in Xiongnu tombs. I anticipated discovering patterns of association along ‘axes of difference’ (Smith, 2004); for example, “women buried with cattle, men buried with horses”, or “more herd animals are buried in tombs that hold multiple humans”. From these patterns of association I would be able to extrapolate beliefs and logics that organized and animated Xiongnu socio-cosmological views of their world. However, when I reunited the human and nonhuman animal remains that had originally been deposited into each tomb by correlating the bioarchaeological and zooarchaeological data on the constituent social beings and comparing the resulting assemblages from the eight different Xiongnu tombs, I found no pattern of association.

Although a sample size of eight assemblages is insufficient for meaningful statistical assessments of correlation or likelihood, the variability in who the living Xiongnu assembled in each tomb at Elst Ar – how many people of what age and skeletal sex[92], how many and what kinds of domesticated herd animals who died at which ages – contrasted with my expectations of orderly associations. The minimum number of individuals (human and herd animal) whose body-parts were interred in the tomb; the taxa present (*H. sapiens*, *Equus* sp.; *Bos* sp.; *Ovis aries*; and *Ovis/Capra*); the estimated ages-at-death; the assessed skeletal sexes (when possible); and the paleopathological signs (osteological markers of physical trauma, joint wear and degeneration, infection, and biomechanical workload evidenced by muscle attachment sites) all varied from tomb to tomb at Elst Ar. I despaired at this lack of pattern. How could the deliberate associations of humans and herd animals in highly-charged spaces of cosmological, ideological, and political import appear so random? It then occurred to me that I was assuming something not in evidence. Were the once-living social beings that I framed as interchangeable because of their sociological markers – young women for young women, old men for old men, horse for horse, lamb for lamb – actually interchangeable to the Xiongnu who built their tombs at Elst Ar? What would happen if I revisited the importance of specificity in who comprised each multispecies mortuary assemblage?

The Xiongnu who buried their dead at Elst Ar did enact an overall pattern – assembling together humans and herd animals – yet followed no set recipe of association; no recipe of "women buried with cattle, men buried with horses" emerged. The consistent repetition of form

[92]In the eight relational osteobiographies, assessments of skeletal sex are often extrapolated to a past human's gender. This was not possible for many bioarchaeological reconstructions, due to insufficient osteological evidence or an ambiguous skeletal sex assessment. However, the direct extrapolation of gender from more secure assessments of dimorphic (skeletal) sexual traits in the human skeletal system is highly problematic. In the context of this project, genders attributed to the human elements of the eight relational osteobiographies should be read as heuristic rather than definitive.

(multispecies mortuary assemblage) varies in terms of osteobiographical details, which implies that specific social beings (humans and herd animals) were placed deliberately into relationships through mortuary ritual. The specific details observable in the bones, teeth, and horncore of herd animals and humans are materializations of a social being's lived experience. It is important to note that those specific lived experiences do not imply direct bodily relations between the particular humans and herd animals assembled together in one Xiongnu tomb at Elst Ar. The specific bodily details, the osteobiographical indicators, index a particular social being but also a social being constituted by and embedded within specific *kinds* of material interspecies interactions.

The lived experiences of these people and their herd animals as manifest in their durable bodily remains indicate nothing about whether the specific humans and herd animals in each tomb at Elst Ar had any direct relationships during their lifetimes. No evidence supports an argument that *Akhmad* ever rode either of the geldings or stallions buried with him, or that either of those two horses came from the same horse herd as one another (or the other two adult horses from Grave 001 at Elst Ar). However, the human element of *Akhmad* as known from his bodily remains plausibly rode horses. As plausibly a herder who engaged in a herder's arduous, expert labor over a lifetime likely rode and formed relationships with at least one horse in that lifetime.

Moreover, the four horses of the *Akhmad* assemblage may not have been ridden at all – although the ages of the two geldings or stallions would be consistent with riding horses. However, they were born and bred in a mobile pastoral community. Their births would have been planned and perhaps physically assisted by their herders, they would have nursed from and then followed their mothers across the steppe under the management of their herders on horseback, they may have been broken for riding (or even cart or chariot work), they may have sired or birthed their own foals in their time, and so forth. The bodily remains comprising the *Akhmad* assemblage are consistent with the argument that those once-living social beings engaged in types of bodily interactions that comprise the multispecies relationships of herders and five muzzled beasts in mobile pastoral lifeways.

Each Xiongnu tomb at Elst Ar is the result of specific community members burying their dead. Their dead – the occupants of each tomb – human and herd animal alike at Elst Ar – were unique social beings who led lives through specific interactions with other herders and herd animals who dwelt with them in their mobile pastoral lifeway. At the level of lived experience intertwined with individual ontogeny, each social being (human or otherwise) was unique in their body and their lived experiences as material, bodily interactions. The human element of *Akhmad* in Grave 001 likely inhabited the same broader social world as the human element of *Saakhalt* in Grave 012, but these people would not have been interchangeable to their multispecies communities.

Moreover, the herd animal element of each multispecies mortuary assemblage may not have been interchangeable to the living Xiongnu who interred them. It strains belief that mobile pastoral peoples would consider horses and cattle interchangeable (functionally or symbolically the same), especially in the ideologically-charged realm of mortuary practice (Parker Pearson, 1993; Robb, 2007). The horses, sheep, goats, and cattle of *Akhmad* (Grave 001) would not be interchangeable livestock 'units' in the eyes of a herder. Even herd animals of the same type (species/taxon plus age class and skeletal sex) would not be truly interchangeable. Adult cattle of the same age class buried in one tomb were birthed from their own mothers, raised and tended by specific herders, and accompanied in pasture by particular other cattle and herd animals. This is equally true for intratomb comparison: the cattle element of *Akhmad* was not and is not truly interchangeable with the cattle element of *Saakhalt*. From this observation that specificity in the osteobiographical details shaping each multispecies mortuary assemblage at Elst Ar was a constitutive quality for understanding its contours and constitution I inferred that particularity and specificity in the relationships being constructed for these herd animals and their herd animals was a crucial logic animating Xiongnu mortuary ritual at Elst Ar.

Particularity and specificity of social beings manifest in their bodies and the interspecies entanglements that shape and are shaped by those bodies are highly relevant to the dynamics and organization of herd animals and herders who comprise mobile pastoral communities. Ethnographic accounts from present-day Mongolia and southern Siberia demonstrate that the herders in these households and communities are keenly aware of individual herd animal life histories manifest in their bodily qualities: age, sex, health, temperament, coloring/appearance, and taxon/species (see Chapter 5: Fijn, 2011; Marchina, 2015). Suffused throughout their observations are the ways in which details and specifics of these herd animal bodily qualities play constitutive roles in the kinds of interactions they have with their herders and with other herd animals. For example, a 4-year-old ram in rut interacts with a young girl herding on foot very differently than a 6-month-old lamb does; during milking season, the middle-aged woman who milks the 3-year-old yak cow interacts with the animal very differently than a teenager who rounds up the mother animal, separates her from her calf, and hobbles her does. The Mongolian and southern Siberian ethnographic data indicate that bodily details and specifics of human herders and herd animals alike shape multispecies relationships and entanglements in mobile pastoral societies in terms of key practices, values, and beliefs of the herders themselves. If observed in ethnographic settings, could analogous suites of bodily techniques, seasonal rhythm, affect, and ideologies have been developed and deployed by mobile pastoralists past, such as the

Xiongnu at Elst Ar? If so, a high probability exists that the mortuary contexts created by those past herders would hold evidence of those beliefs and values, as societal ideologies and cosmological appear in heightened forms in mortuary ritual and production of mortuary space (Trinkaus, 1984).

Specificity in the social beings and the relationships into which they had been assembled indexed variability and fluidity as qualities of the multispecies mortuary assemblages (within the broader pattern of humans with herd animals). Given that those qualities describe materials assembled through mortuary ritual and the production of mortuary space, they may be deliberate results of Xiongnu mortuary practice. Variable, fluid associations of humans and herd animals also describes a fundamental method used by mobile pastoral communities and societies for organizing their multispecies membership: the herd.

9.4 Thinking Through The Herd

The term 'herd' generally refers to a nonhuman social group (but see Mlekuž, 2013), but ethnographic accounts from mobile pastoral lifeways (particularly in Mongolia and surrounding environs, see Ch. 5) reveal complexity in that to which the term denotes. 'Herd' may indicate: all domesticated herd animals (five muzzled beasts) of a given institution (family, collective, monastery, etc.); all five muzzled beasts of a given kind (the horse herd vs. the camel herd); a collective of livestock as it dwells in and moves across the landscape (horses, sheep, and goat grazing in a loose, shifting constellation around the shared endeavor of grazing); a population within a larger collective or grouping of kind (i.e., a herd of nursing cattle kept from their calves during the day swells to a herd of mothers and their young when reunited).

The herd is a foundational unit for pastoral societies that describes and organizes the nonhuman domesticated animals at the core of its lifeway. In Chapter 5, the multispecies herding communities of present-day Mongolia and southern Siberia were comprised of fluctuating, flexible assemblages of herders and herd animals. For the five muzzled beasts, their herds organize and take shape along temporal rhythms (daily, seasonal, annual), logics of species or kind (as a taxonomic product of cultural context intersecting with animal biology), by age and sex within a given species or kind, and by purpose (often productive emphasis; for example, during milking season nursing mothers are separated from their offspring into their own herd during the day and reunited into a larger herd of mothers and young after milking).

Herds shift and take shape in context. A herd of pregnant ewes in December will become a herd of nursing ewes in May. Those lactating ewes will likely be kept away from their lambs for most of each day in May so that they may be milked and may graze in pastures and conditions perilous to newborns. But by August the lambs will have been fully reunited with their mothers, as they will have grown and been weaned in order to graze with the summer herd. Because calves nurse from their mothers for a longer span of their young lives than sheep and goats, they may be kept in their own little herd of cattle for much of each day until they are over a year of age (i.e., long after lambs and kids have been weaned from their mothers). This little herd of young cattle will swell the ranks of the herd of mother cows and heifers for the period of time each day when allowed to join their mothers and nurse. This year's calves become next year's steers, cows, or bulls; this year's steers become next year's meat and hide, and this year's heifers become next year's milk cows.

A herding group or family may keep horses, cattle, sheep, and goats, which in one sense constitute a herd, and in another constitute multiple herds along lines of species, age, and sex.

The sheep and goats form a herd that follows snow-digging horses in winter in order to graze, as is common practice in modern Mongolian mobile pastoral contexts. However, in summer that same herd of sheep and goats rarely crosses paths with the herd of mares and their stallion. Neighboring herding groups may find that their horse herds have commingled out in the pastures. They must then work to sort this “mega-herd” into the bands each comprised of a stallion and his mares and offspring that belong to each group. These examples drawn from mobile pastoral contexts in modern Mongolia emphasize that what constitutes a herd is contingent upon setting, and is in flux over time and in space.

Herds of five muzzled beasts organize themselves along these rubrics and are organized along these rubrics by their herders. In a mobile pastoral context, a herd is thus an assemblage inherently social and biological. Moreover, the herd itself is an assemblage: it is a fluid, contingent entity that takes a given shape under given conditions. In mobile pastoral lifeways, herds are not natural units but living assemblages that form and shift under the direction or influence of human intention. Thus, envisioning a herd within a mobile pastoral lifeway is misleading and incomplete: each iteration of herd, each assemblage-in-flux, of necessity involves humans. Human herders interact with – lead and manage – their herd animals. Given its popular understanding, ‘herd’ as a term does not sufficiently account for the human element in the variable, fluid, and contextual multispecies assemblages comprising the core of mobile pastoral lifeways.

9.5 Bringing Herders Back to The Herd: The Pastoral Fold

Because the term 'herd' generally connotes natural, inherent, or biologically-determined groupings and collectives of nonhuman animals to the exclusion of humans, this project suggests the term 'pastoral fold'. The project suggests pastoral fold in the place of herd because it assembles human herders and herd animals together in accord with the argument that mobile pastoralism is a multispecies endeavor, and the observation of human and herd animal remains consistently interred together in Xiongnu tombs. As a term, pastoral fold integrates three meanings of 'fold': "an assembly of people joined together in a common faith or activity", "a flock of sheep", and "an enclosure for sheep". A pastoral fold explicitly assembles human herders together with their herd animals into a biopolitical assemblage where material realities and social ideologies interdigitate. Each tomb-scale assemblage of humans and herd animals is an iteration of the pastoral fold. Thus, a relational osteobiography generated for that assemblage is a narrative interpretation of a specific iteration of the pastoral fold.

As argued previously, the relational osteobiography generated for each assemblage at Elst Ar is an empirically-grounded interpretation of the specific bodies that comprise it, with the understanding that those bodies came into being through lived experiences of interspecies interactions, and the relationships constructed for those once-living social beings by living Xiongnu through mortuary ritual. Relational osteobiography facilitates inference or reconstruction of values, logics, and beliefs operating in Xiongnu mortuary ritual as worked with and through the bodily remains of herd animals and humans. Mortuary ritual is a form of discourse about how the social world ought to be, including the ordering of the social beings who dwell in it (Leach, 1954; Fowles, 2013). At Elst Ar, as appears to have been the case at Xiongnu cemeteries across the imperium, funerary officiants and ritual celebrants enacted these ideologies through and with bodily realities (relationships) beyond their control: social bodies as ontogenetic, relational materials. Relational osteobiographies comprise things as they are – the bodies of humans and other animals as material, interrelational, and contextual – in conversation with things as they should be – the arguments, assertions, and aspirations about those human and nonhuman bodies and their proper order.

In assembling each particular constellation of humans and herd animals – once-living social beings who comprise the core of mobile pastoral lifeways – the Xiongnu evince their preoccupation with the right ordering of a multispecies social world. Yet the specifics of each ordering are not fixed but fluid and variable. The declarative or performative character of each multispecies mortuary assemblage at Elst Ar aligns with the variability in the actual contents of each iteration. Following the previous descriptions of a herd, which morphs and takes shape along daily, seasonal, annual, productive, and taxonomic (cultural and otherwise) logics, pastoral fold denotes a fluid biopolitical category that is always under construction, always negotiating intersections of biological processes and social dynamics, and always contingent.

The act of iteration itself – the act and declaration of assembling humans together with their herd animals in particular constellations of association – animates Xiongnu mortuary practice at Elst Ar. Each performative act – each assembling of humans and herd animals – constructs relationships that bring into being a specific iteration of pastoral fold. Each iteration of pastoral fold is organized around particular kinds of human-animal relationships (multispecies entanglements) in a mobile pastoral lifeway that are embodied in these specific humans and herd animals from the perspective of the Xiongnu who buried them together. Each multispecies mortuary assemblage was a specific iteration of a pastoral fold. While the assembling of humans and herd animals together and constructing them into specific iterations of a pastoral fold are not likely to be the exclusive logics behind the presence of nonhuman animals in Xiongnu tombs (at Elst Ar or other cemeteries), the deliberate associations of both nonhuman animals and the humans with whom they were intentionally interred are accounted for with the concept of the pastoral fold.

In this articulation, the Xiongnu preoccupation of gathering together humans and other animals (in parts and wholes) focused on the domesticated herd animals of modern and historical mobile pastoral lifeways in Mongolia (and Northern and Inner Asia more broadly) draws on a deep socio-cosmological investment in the multispecies relationships that sustain and comprise those lifeways. The pastoral fold draws on and literally works with the raw materials of mobile pastoralism: human herders and their herd animals, together. Moreover, that mobile pastoral Xiongnu would have been familiar with the complex, ambivalent, and embodied dynamics that shape herder-herd animal relationships into specific, lived experiences co-constituting social beings is consistent with the careful particularities of each multispecies assemblage at Elst Ar. The relational osteobiographical perspective allows the analyst to put the person, horses, cattle, sheep, goats, and lamb or kid of the *Akhmad* assemblage back together. It also affords a plausible glimpse of those lives as complex, life-long interactions with other social beings, and of how they were assembled into relationships in death. Each relational osteobiography is an empirically-grounded interpretation of those lived experiences corporealized and how living Xiongnu composed them into a specific iteration of the pastoral fold. What, then, does the pastoral fold do as a concept of and for the Xiongnu, and as a concept for analysts of the Xiongnu?

9.6 Putting The Pastoral Fold to Work: The Relational, Contextual, Multispecies Nature of The Xiongnu Social Order

As a concept or unit among the Xiongnu expressed or negotiated in mortuary practice, the pastoral fold presents a method for constituting and asserting a relational, multispecies (or interspecies) form of sociality. Ritual, particularly mortuary ritual, is a form of discourse about the relationships that connect social beings into the right order in accordance with how the social world ought to be (Fowles, 2013). As enacted in mortuary ritual, the pastoral fold is an assertion that a fundamental component of the Xiongnu social order is humans and herd animals arranged and re-entangled in the relationships that sustain and shape them and the shared mobile pastoral social world. This social order, when arranged properly, is relational and multispecies: in the Xiongnu worldview, people and livestock belong together, and it is through their relationships that they constitute meaningful units or social units or assemblages that constitute the social world.

Each iteration of the pastoral fold – each performance or declaration about the right ordering of this relational, multispecies social world – is specific and contextual. *Saakhalt* comprises two specific people, two particular cattle, and a very young calf perhaps not long separated from the body of the specific cow who was its mother. The constellation they comprise, assembled by living Xiongnu operating in the potent social arena of mortuary ritual, is not the same in contents nor arrangement as the constellation that is *Akhmad* or *Khos*. Each iteration of the pastoral fold is a declaration of the necessity of herd animals and humans placed into relationships with one another to constitute the social order.

Eight multispecies mortuary assemblages from a single type of mortuary context (ring tomb) from a single cemetery in Central Mongolia provide the empirical basis for relational osteobiography as a method and pastoral fold as a concept. Such a dataset is obviously limited in scope: multispecies mortuary assemblages from eight tombs that comprised roughly a third of the total ring tombs that comprised this single Xiongnu cemetery. The scale of ideology in practice observed comprises of social beings and their lived experiences drawn together by a political community's ritual activities in producing mortuary space. If the pastoral fold and what it means for Xiongnu mortuary ideology and socio-cosmology were contained to Elst Ar, the concept would still provide a productive, illuminating glimpse into how members of a specific Xiongnu political community (affiliated through joint exercises in collective social action in the form of mortuary ritual and the production of mortuary space at Elst Ar) assembled and asserted a significant form of social identity or subjectivity. The lived experiences and interdependent relationships of specific Xiongnu people and their herd animals were so meaningful to that political community that living members reconfigured and reified them into claims about the nature of the social world again and again.

However, available evidence indicates that the pastoral fold is a concept with application beyond the scale of a single tomb. The prevalence of intentional multispecies assemblages in Xiongnu mortuary and ritual contexts across the imperium and the observed (though not elaborated upon) variability in those assemblages within and between cemeteries strongly imply that the pastoral fold and its enactment were imperial ideological preoccupations. What, then, might be broader scales at which the Xiongnu enacted the pastoral fold? A scale out from the single tomb has been partially sketched in this project: a Xiongnu cemetery as a whole. Only eight multispecies mortuary assemblages provided empirical data for this project, but the pastoral fold (and speculations about Xiongnu socio-cosmologies and politics below) emerged from these data when the eight relational osteobiographies were considered as components of a greater whole. Future research into the pastoral fold – its empirical validity and its interpretive utility – would be well-served to examine entire the totality of pastoral fold iterations in one Xiongnu cemetery and the totality of cemetery-scale pastoral fold iterations in different archaeological landscapes within the Xiongnu imperium.

The pastoral fold in evidence at Elst Ar embodies Xiongnu ideologies enacted at the scales of social beings and local political community. As historians and archaeologists agree that little is known about this scale of Xiongnu society and imperial life (Sneath, 2007; Miller, 2009, 2014; Honeychurch, 2015), these relational osteobiographies and what they suggest about belief, values, and multispecies relational sociality are valuable contributions to the archaeological imagination about the Xiongnu. To wit, that a ubiquitous dimension of mortuary practice was the declaration that the social world rested upon herd animals and their humans being together, a socio-cosmological belief that collective identity was multispecies and relational. If valid, the development of the pastoral fold and its various iterations at Elst Ar evince a Xiongnu community for whom being and becoming a subject, a being that mattered in the socio-cosmological order, was to be embedded in relations with other raw materials of mobile pastoralism: herders and herd animals.

Such a possibility represents a radical shift in interpretations of the Xiongnu that rest on the assumption that the Xiongnu shared the broad Western ontological commitment to the distinctness and primacy of the human in opposition to the nonhuman (see Chapter 6). The pastoral fold instead suggests that Xiongnu ontology was relational and material, more akin to ontogenies of being and society than transcendental categories. Entertaining the possibility that the Xiongnu viewed themselves and their social world from a radically different perspective, and enacted the logics of their views in heightened form during mortuary ritual, opens the door for further creative speculation about Xiongnu politics and ideologies constructed from the ground (or tomb) up.

9.7 Alternative Political Pathways? Care and Asymmetrical Interdependence in The Social Reproduction of Xiongnu Multispecies Herding Households and Communities

Before inferring the pastoral fold from the eight Elst Ar relational osteobiographies, I inferred certain values or logics enacted in more than one of said relational osteobiographies. One such value or logic was care. In Chapter 5 I argued that care comprises the human element of mobile pastoral lifeways, particularly as observed in present-day multispecies herding communities in Mongolia and southern Siberia. Care in this context encompasses both praxis and philosophy herders deploy to foster and maintain good health and overall wellbeing in their herd animals through a repertoire of knowledge and techniques concerned with far more than economic production. Because the health and wellbeing of individual animals impacts the health and wellbeing of the herd, and the health and wellbeing of both directly impact the health and wellbeing of the people of the multispecies household, care is a practical logic of social reproduction operating through the inherently entangled nature of mobile pastoral lifeways. The Mongolian herder's statement, "we feed them and they feed us" (see Chapter 5), is a recognition of well-being bound up across species lines. It declares a socio-cosmological ethic: herders and herd animals are interdependent, and their co-work in mobile pastoral lifeways is mutualistic. Care provided by humans is thus essential to mobile pastoralism at the scales of individual animals, herds, the multispecies household, and the multispecies community. But care is not a power-neutral ethic and the interdependence of herd animals and their herders is asymmetrical.

The fluid constellations of herd animals and their herders in life are assemblages where power moves unevenly. As discussed in Chapter 5, human herders may not exercise total control over their herd animals, but their intentions and desires dominate the methods and forms in which their care is provided to (or enacted upon) their herd animals. Thus, herders are the social beings who have an outsized, deliberate influence on joint multispecies endeavor that is mobile pastoralism. A further asymmetry resides in the reciprocity and mutualism of mobile pastoral lifeways encapsulated as "we feed them and they feed us", what Peemot (2019) calls asymmetrical interdependence.

How herd animals 'feed' herders differs from how herders 'feed' their herds on crucial grounds. Herd animals are called upon to give up their lives for herders, never the other way around. Humans must kill their animals if they are to dwell in and sustain a (mobile) pastoral lifeway, as many pastoral products require an animal's life. Moreover, in securing the health and well-being of the herd, herders cull certain animals for the 'greater good' of the herd and the multispecies household over time. The slaughter and consumption of herd animals are loci of complex affective and cosmological regimes among multispecies herding communities in Mongolia, southern Siberia, and Inner Asia more broadly. The role of humans in these mobile pastoral lifeways is not straightforward domination or control, it is the ambivalent power and responsibility of providing care, which is nurture and protection interdigitated with slaughter and devouring. To plan and carry out the deaths of their herd animals is a herder's prerogative; to kill the animals that they raised and sustained from birth is a herder's burden.

Seen in specific relational osteobiographies at Elst Ar, certain iterations of the pastoral fold perform this articulation of care inherently bound up in asymmetrical interdependence. A possibility, therefore, is that care of the mobile pastoral character described above mirrored a crucial political logic among the Xiongnu who buried their dead at Elst Ar that knit together social beings into the socio-cosmological order. Implied in the asymmetrical interdependence model of care is obligation. Obligation would be similarly asymmetrical, if so. Where a herder's obligation to provide care for individual animals, thus ensuring the wellbeing of the herd, multispecies household, and multispecies herding community, other herder obligations might be even more ambivalent. What is the head of a multispecies household obligated to provide for other herders of the household? What are their obligations in turn? How do herder obligations scale out to their multispecies community or to their political community? These questions raise the issue of Xiongnu political dynamics and the subject positions, institutions, and scales in which they are enacted.

9.8 From Herds and Households to Elites and Empire: Speculating on The Relationship of The Pastoral Fold to Imperial Xiongnu Political Life

Consisting of only eight iterations of the pastoral fold crafted into relational osteobiographies, it would be difficult to argue that the dataset generated in this project speaks directly to broader political dynamics, imperial institutions, and societal organization within the Xiongnu Empire. The project's dataset, however, is not the only impediment to such inquiries. The current state of knowledge about the Xiongnu and their empire render much of both opaque. Historical texts do document important elements of imperial organization and administration (see

Chapter 1). These include: the tripartite geographic administrative structure of imperial-scale rule (the wise kings of the left and right under the *shanyu*: (Di Cosmo, 2002; Atwood, 2004; Sneath, 2006, 2007; Honeychurch, 2015); the decimal system for military-civil organization of the imperial (subject) population (myriachs leading 10,000 [though often less] households: Di Cosmo, 2002; Atwood, 2004; Sneath, 2006, 2007; Honeychurch, 2015); and the existence of regional elites and 'lesser kings' within the Xiongnu sociopolitical hierarchy (Miller, 2014). These same sources provide little or no insight into the subjects, communities, and articulations like 'households[93]' who comprised the bulk of the imperial body-politic. The dataset and relational osteobiographies generated in this project do not provide plausible empirical linkages between the pastoral fold and political institutions and offices of the Xiongnu Empire known through historical sources. How, then, to investigate intersections and interdigitations between the pastoral fold (as observed at Elst Ar) and other forms and scales of Xiongnu societal organization and imperial administration, when so little is known of them?

Recent archaeological work suggests a shift in perspective: examination of the political dynamics operating within the Xiongnu Empire manifest in the material record (and correlated to textual accounts) reveals more about the polity and its constitutive elements than continued focus on political typologies and static institutions comprising them (Miller, 2014; Honeychurch, 2015; Miller and Brosseder, 2017). Turning to the material record, recent archaeological work proposes that examining the political dynamics operating within the Xiongnu Empire yield more insight into the formation, propagation, and history of the imperial polity than attempts to organize a scheme of institutions and systems.

[93]The *Shi ji* refers to 'households' (see Sneath, 2007) under the administration of decimal system rulers ('leader of ten thousand households', i.e., myriarch) within the Xiongnu Empire, but does not elaborate upon the nature or composition of these 'households'.

Scholars pursuing this line of inquiry argue that the Xiongnu as an imperial formation arose and endured through dynamic engagements between political agents and collectives at local, regional, imperial, and extra-regional scales. Honeychurch emphasizes the roles of cooperation, persuasion, and negotiation in the ideologies and praxis that formed the methods by which political communities 'scaled up' into the Xiongnu imperial formation (2015). Collective ritual, including mortuary practice, was a powerful arena in which these political dynamics played out. Analogously, Miller and Brosseder argue that mortuary ritual and the production of mortuary space were venues where distinct strata of Xiongnu elites competed for prestige and authority (2017). These contestations enabled transformations of political ideology and either reflected or influenced empire-wide changes in political culture. Although specific ideologies or ritual logics animating these negotiations, contestations, and transformations manifest in Xiongnu mortuary contexts are somewhat unclear, the pastoral fold and its enactment could represent one such logic. What the pastoral fold and its clues about the socio-cosmological potency of care within Xiongnu communities could add to the regional, imperial, and extra-regional scales of dynamic political collaboration and conflict manifest in mortuary practice is a logic of social affiliation and reproduction from the 'ground up' (i.e., drawn from the mobile pastoral lifeway itself). The 'from the ground up' quality of the pastoral fold might index that is comprises that local scale of mortuary ritual and imperial ideology. The fluid, variable, and contextual character of the pastoral fold implies that it is flexible and capacious enough to accommodate socio-cosmological values and beliefs at scales of lived experience and local communities. Said fluidity, variability, and contextuality could mean that, as a logic of multispecies socio-cosmology, the pastoral fold may have been a specific ideological or ritual mechanism by which political communities connected together and scaled up into the Xiongnu imperial polity.

Because deliberate multispecies assemblages have been recovered from the preponderance of Xiongnu mortuary contexts across the temporo-geographic span of the empire, the possible tomb-scale iterations of the pastoral fold were enacted across the jockeying elite strata of imperial society buried in platform tombs as well as more 'humble' ring tombs (Miller, 2009, 2014). If the pastoral fold was a method for assembling and asserting a form of relational, contextual multispecies collective identity or subjectivity believed essential in local communities comprising the majority of the body-politic, why might it have been enacted by regional elites and the upper echelons of the imperial hierarchy? Referring to Honeychurch's interpretation of communications between the *shanyu* Modun and Han emperor Wen, perhaps the pastoral fold offers a logic by which imperial elites imbricated themselves into a collective subjectivity shared throughout the body-politic. In mortuary ritual, imperial elites could simultaneously perform their membership in a collective subjectivity animated by potent beliefs and values drawn from mobile pastoral lifeways in tandem with the displays of prestige and symbolic authority objectified in 'luxury' grave goods. Whether the *shanyu* or either of the wise kings herded livestock was unimportant, but they and other Xiongnu thought they *ought to be* entangled with livestock in the kinds of relationships that sustained the lifeway believed to constitute the empire (mobile pastoralism). In this line of reasoning, a core aspect of 'Xiongnu-ness', or Xiongnu political subjectivity, was constructed and asserted through assembling a pastoral fold; thus, to be a Xiongnu imperial subject (rather than a subjugated person within the empire) would have required membership in a pastoral fold. Perhaps becoming Xiongnu was to be together with herd animals and other humans.

9.9 Conclusion

These potential linkages between the tomb-scale iterations of the pastoral fold at Elst Ar and broader themes in Xiongnu mortuary ideology, political dynamics, and imperial subjectivity are speculative. However, they represent avenues of inquiry into the Xiongnu that rest on the reconsideration of how the Xiongnu may have constituted their social worlds in belief and practice. The intentional assemblings of humans and herd animals in mortuary space, again and again, constitute direct empirical evidence that the Xiongnu believed the meaningful constitution of their social order and collective identity to be relational and multispecies.

The pastoral fold represents a possible mechanism by which the Xiongnu polity leveled up into an imperial formation of Mongolia and southern Siberia: a shared form of subjectivity or collective identity rooted in the complex material and affective realities of mobile pastoral lifeways as multispecies endeavors. A political subjectivity articulated with the raw materials of mobile pastoralism represents an ideological project that herders and mobile pastoral communities found ideologically persuasive. On the other hand, the pastoral fold and its iterations detected at Elst Ar were enacted in mortuary ritual in tandem, conflict, or negotiation with other logics of Xiongnu mortuary practice (notably 'prestige' assemblages or 'luxury' grave goods associated with imperial elites). Current research in Xiongnu archaeology suggests that some of the political dynamism characterizing the imperial polity resided in fractious intersections between autochthonous or autonomic identities and regimes of value at local and regional scales and an elite culture of political authority and ideology; the empirical evidence for these intersections appear largely in Xiongnu mortuary contexts. The pastoral fold may serve as an analytic for examining these intersections and for enriching our imagination about the majority of the imperial body-politic: the herders and their herd animals who belonged together in life and in death.

CHAPTER 10

CONCLUSION

This project is a long, circuitous trek from the introduction of the Xiongnu Empire to the pastoral fold and its ramifications for understanding Xiongnu social worlds, imperial ideology, and potentially political dynamics specific to mobile pastoral states and imperial formations. From another perspective, this has been an exploration of the Xiongnu starting with the empirical and the tangible to infer the theoretical and interpretive in six major steps: 1) human and other animal bones 2) deliberately arranged into assemblages 3) in Xiongnu tombs resulting from 4) iterations of the pastoral fold, a logic inferred from 5) relational osteobiographies, which operationalized 6) living materiality, the theoretical orientation towards human and other animal relationships as materially mediated. Below is a more leisurely tour through the main arguments structuring the dissertation, following by some woolgathering on the possible directions and implications for the pastoral fold in future research.

From the beginning of this project and their earliest articulation as an object of analysis, to understand the Xiongnu is to understand them as herders together with their herds. This project presents the Xiongnu as mobile pastoralists for whom mobile pastoralism is fundamental to understanding them as an object of analysis as well as to their understanding of themselves. Chapters 2 and 3 largely concerned the evidence supporting the idea that mobile pastoralism was key in the articulation of the Xiongnu viewed from the outside. Primary Chinese-language texts produced by scholars during the Han dynasty evince the centrality of mobile pastoral lifeways as alien to themselves and constitutive of the Xiongnu. This textual record includes evidence that the Xiongnu consciously identified as mobile pastoralists and that the political elite (personified in the relevant text by the *shanyu* himself) espoused a mobile pastoral way of life as a (if not the) constitutive logic of the Xiongnu imperial political project.

Archaeology of the Xiongnu built upon this legacy with discovery of empirical evidence for mobile pastoral lifeways in the form of livestock bodily remains recovered during the earliest proto-archaeological explorations of Xiongnu mortuary contexts in Siberia and Mongolia. In subsequent decades archaeologists identified this phenomenon – domesticated herd animal remains intentionally deposited in Xiongnu mortuary contexts – in ring and platform tombs across the temporo-geographic span of the empire in a near-universal dimension of Xiongnu mortuary practice. While archaeologists (Dorjsüren, 1961; Batsaikhan, 2003; Miller et al., 2018) have argued that this phenomenon demonstrates the centrality of pastoralism to Xiongnu ideology and society, the practice of assembling livestock (and other nonhuman animal remains) in Xiongnu mortuary contexts and its implications remains undertheorized and underexplored. It is this underexplored dimension of Xiongnu mobile pastoralism – the pastoral – upon which the dissertation project focuses.

In the context of mobile pastoralism, we may understand the pastoral as encompassing the relationships between humans and their domesticated herd animals. Key evidence – the most direct empirical, tangible evidence – for the centrality of these human-animal relationships in Xiongnu social worlds derives from the consistent inclusion of livestock remains in Xiongnu tombs. Tombs by definition are built to house human remains; Xiongnu tombs – both ring and platform – house both human and nonhuman (particularly domesticated herd) animal remains. Xiongnu tombs are as close to an indigenous category of and used by the Xiongnu that archaeologists are likely to perceive. Arguably, archaeologists know the Xiongnu primarily from their tombs (and the contents of those tombs) built again and again across the span of the empire.

That the primary evidence for the centrality of (mobile) pastoralism to Xiongnu ideology and society is found in their tombs is particularly significant. Because mortuary space is pregnant with heightened ideological, political, and cosmological significance of a given society, investigation of those contexts should yield insight into potent logics, values, and beliefs of that society. This project narrowed its scope of investigation into Xiongnu mortuary space by targeting the ubiquitous inclusion of nonhuman animals, especially livestock, in those contexts by living Xiongnu. But rather than examine the nonhuman animal remains in isolation, the project drew inspiration from textual records of Xiongnu mobile pastoralism and from ethnographic accounts of multispecies mobile pastoralism in present-day Mongolia and southern Siberia to reframe these as nonhuman animals placed together with humans. These ethnographic accounts enriched the project's formulation of mobile pastoralism into that of a multispecies endeavor, where the relationships between human herders and their domesticated herd animals constitute the 'raw materials' of mobile pastoral lifeways.

The examples from multispecies herding communities in modern-day Mongolia and southern Siberia reveal that the bodily interactions between herders and herd animals to comprise the constitutive material dynamic of mobile pastoral lifeways: milking, assisting in livestock birthing, castration, shearing, riding, slaughtering, and butchering. These multi- or interspecies bodily interactions are best understood as human engagement with the jointly material and social qualities of livestock, where the human element in these relationships comprises management, care, and obligation rather than complete control and domination. The ethnographic perspective on mobile pastoral lifeways, particularly in Mongolia and southern Siberia, present herd animals and their herders as companion species (Haraway, 2003) who come into being through their material interactions over days, seasons, years, generations, and millennia.

Mobile pastoralism as a multispecies endeavor is thus a particularly close and complex instantiation of the materially-mediated relationships between humans and other animals that generate and are generated by more-than-human social worlds. The relationships between humans and other animals are of necessity material because their material bodies are the vehicles through which those relationships are enacted as well as the media upon which those relationships act. This is the novel concept of living materiality, which provides the theoretical framework for the project's analysis of the relationships between humans and herd animals of the Xiongnu Empire as evidenced by their consistent assemblage in mortuary contexts. Archaeology is ideally suited to examine the dynamic, material nature of multispecies relationships and the constitution of more-than-human worlds that unfold along complex temporal rhythms; bioarchaeology and zooarchaeology in particular comprise methodologies of living materiality thanks to their focus on bones, teeth, horncore, antler, shell, and other durable forms of living materiality that appear in the archaeological record.

The project introduces a second novel concept to operationalize its theoretical framework of living materiality: relational osteobiography. Relational osteobiography is a methodology that builds on an established bioarchaeological method of analysis and interpretation used to reconstruct an individual's life history from their bodily remains due to the jointly biological and social qualities of osteological tissue that develops along biological trajectories within a given social field: osteobiography (Saul and Saul, 1989). Relational osteobiography expands to consider the ways in which human and other animal bodies come into being through their material interactions, which inherently intersect with biological pathways of development in a social field. The intentional assemblages of human and livestock remains in Xiongnu tombs are ideal targets for relational osteobiographical analysis for two reasons. First, these once-living social beings and their life-long material entanglements formed the beating heart of Xiongnu mobile pastoralism, and their bodily remains contain information about the activities, practices, and events that formed those relationships. Second, the living Xiongnu who deliberately assembled these humans and livestock together in death were constructing relationships between them in mortuary ritual. Relational osteobiographical analysis of Xiongnu multispecies mortuary assemblages offers empirically-grounded interpretations of: 1) lived experiences made manifest in skeletal remains consistent with core interspecies interactions in mobile pastoral lifeways (i.e., milking, assisting in livestock birthing, shearing, riding, slaughtering, castrating, butchering, and so forth), and 2) relationships between specific humans and particular domesticated herd animals that living Xiongnu constructed through mortuary practice. This assembling suggests a mode within mortuary ritual by which the Xiongnu performed or enacted the way their social world *ought to be*: "a kind of exegesis on worldly interconnection in which claims are made about the order of things, claims that may sometimes be designed to end quarrels but that are nevertheless always open to dispute, rejection, or revision" (Fowles, 2013: 151)

Relational osteobiographical analysis of Xiongnu multispecies mortuary assemblages was conducted on human and nonhuman animal remains recovered from Elst Ar, a 26-tomb Xiongnu cemetery in the Tuul River drainage basin comprising only ring burials. Using bioarchaeological and zooarchaeological methods (see Appendix D), I analyzed the human and nonhuman animal remains from eight Xiongnu ring tombs at Elst Ar to reconstruct for each tomb: the minimum number of individuals (MNI) present by taxon; number of taxa present; age-at-death estimation; skeletal sex assessment; and paleopathological indicators of trauma, infection, and activity patterns. I reassembled the human and the nonhuman into eight integrated assemblages and used these data to generate narrative interpretations of the lived experiences and constructed relationships made material in their bodily remains.

My initial goal in conducting relational osteobiographical analysis on the Elst Ar assemblages was to identify patterns of association between people and livestock constructed through Xiongnu mortuary practice. Such patterns of association would manifest along empirical ‘axes of difference’ (Smith, 2004) into recognizable formulae like “more herd animals buried in tombs that hold multiple humans”, or “adult men buried with horses, adult women buried with cattle”. I would be able to infer beliefs and logics that organized and animated Xiongnu socio-cosmological views of their world from these patterns. However, the eight Elst Ar relational osteobiographies showed no patterns of association when compared; no recipes from which to read the rules for enacting the Xiongnu social world as they believed it ought to have been. Instead I found variation. The number of people, the ages at which they died, the indicators of their skeletal sex, how many and what kinds of domesticated herd animals, plus the ages at which they died all differed from tomb to tomb. This variability evokes particularity: bodily qualities that index and constitute specific social beings (human and herd animal) whose particularities were significant to the Xiongnu who assembled them into tombs.

But that variation occurred within set parameters. Xiongnu mortuary practice at Elst Ar always marshaled the ‘raw materials’ of mobile pastoralism: the bodies of humans and domesticated herd animals. The Xiongnu at Elst Ar demonstrate that they believed herd animals and their herd animals belonged together in specific constellations and *acted upon that belief.* The variability and fluidity of the eight Elst Ar human-herd animal constellations as uncovered by relational osteobiographical analysis is reminiscent of a core logic by which mobile pastoral groups arrange their members: the herd. In order to highlight that the herds of mobile pastoral lifeways come into being due to long-term human engagement with domesticated herd animals, I introduce the concept of the *pastoral fold* in order to interpret what the living Xiongnu were performing when they assembled their human and herd animal dead at the Elst Ar cemetery.

A pastoral fold is a biopolitical assemblage of human herders together with their herd animals. Material realities and social ideologies interweave into the pastoral fold. Each assemblage of humans and herd animals gathered into a Xiongnu tomb is an iteration of the pastoral fold. Thus, each Elst Ar relational osteobiography narratively interprets that assemblage as a specific iteration of the pastoral fold. The iterations of the pastoral fold Ar indicate that performing a relational, multispecies sociality was a core preoccupation of Xiongnu mortuary practice at Elst Ar with broader implications for the 'right' ordering of its social world. But the iterations of the pastoral fold at Elst Ar reverberate further afield.

While this project only examines human and herd animal bodily remains from eight ring tombs at the Elst Ar cemetery, the widespread and deliberate interment of human and nonhuman animal remains in Xiongnu ring and platform tombs suggests that enacting the pastoral fold was a crucial, perhaps necessary component of mortuary ritual across the imperium. As archaeologists have recovered human and other animal (particularly livestock) remains from Xiongnu mortuary contexts that span (and also those that trouble) the ring-platform typology, these multispecies mortuary assemblages hint that the pastoral fold played a powerful role in Xiongnu imperial ideology.

The pastoral fold may constitute a method of performing "Xiongnu-ness": iteration after iteration of bodily, multispecies relationships drawn from the beating heart of mobile pastoral lifeways to assert a form of Xiongnu subjectivity across what archaeologists can perceive as the socio-political strata and regions comprising the imperium. In particular, the pastoral fold may have functioned as a technique of solidarity and cohesion, a logic whereby political communities could "scale up" through potent values and beliefs drawn from their shared or similar ways of life. The correspondence between the *shanyu* and Han emperor identified by Honeychurch (Chapter 2) recounts a Xiongnu supreme leader who asserted the mobile pastoral character of his body-politic, suggesting that the upper strata of the Xiongnu imperium connected themselves and all their 'subordinate' subjects through a shared way of life. Thus, the pastoral fold would be a material practice taken up by imperial elites to assert their legitimacy and authority.

But the possible implications of the pastoral fold discussed thus far paint a smooth, integrated picture of political dynamics within the Xiongnu Empire. Consider that the pastoral fold may be a logic of communities and local social worlds in tension with other ideologies at play in imperial mortuary ritual. Future research into multispecies mortuary assemblages from other Xiongnu cemeteries across the imperium might hint at local and regional traditions of political autonomy that clash with or contest the more uniform elite mortuary practices, especially those observed in platform tombs dating to the later phase of the empire (see Chapter 4; Miller and Brosseder, 2017). Archaeologists have reported nonhuman animal remains beyond livestock in Xiongnu tombs, including canids, cervids, and a variety of wild animals (e.g., at Ulaan Shiver: Erdenebold et al., n.d.c.). Although domesticated herd animals appear to be present in these assemblages as well, how the 'non-pastoral' interfaces or conflicts with the pastoral element requires further research.

Because the pastoral fold draws from and works through the 'raw materials' of mobile pastoralism – humans and herd animals entangled – it suggests that scholars consider whether analogous practices and ideologies operated in other nomadic imperial formations and mobile pastoral states. Archaeologists like William Honeychurch have previously argued for alternative paths to complexity (2015) that describe the emergence and maintenance of political formations by past mobile pastoral communities, specifically including the Xiongnu. I drew on many of Honeychurch's ideas throughout this project, including the crucial argument that mobile pastoralism should be understood as a lifeway where human-herd animal relationships shape the economic, social, and ideological spheres that comprise a society over years, generations, and centuries. This articulation of mobile pastoralism has major political ramifications, particularly for dispelling notions that nomadic peoples and societies are incapable of political complexity, let alone empire building.

The pastoral fold as articulated in this project raises questions about who the Xiongnu were, what mattered to them, and what they did about it. In other words, the pastoral fold prompts consideration of Xiongnu subjectivity. Previous archaeological research into Xiongnu politics deploys subjectivity as roles within the imperial administration or positions within the sociopolitical hierarchy; consider the regional elites, the "name kings", the *shanyu*, and the Chiefs of Thousands or Tens. Implied here is politics as the domain of the powerful and in power, and of a political world organized along hierarchies of authority and domination. But the pastoral fold calls up an alternative vision of political life within the Xiongnu Empire, where subjects are constituted through performances of potent values, beliefs, and logics drawn from mobile pastoral lifeways.

As seen in the Elst Ar relational osteobiographies, those logics and themes are inextricably bound up in the ambivalence and complexity of human-herd animal relationships that form the lifeway's core. The iterations of the pastoral fold at Elst Ar as relational osteobiographies convey themes of care, obligation, interdependence, pain, hard work, and expertise as manifest in the bodies of actual Xiongnu and their herd animals. The empirical evidence – the bodily remains in the Elst Ar tombs – points to a "Xiongnu-ness" performed and asserted through these mobile pastoral values. The pastoral fold appears as an iterative practice, but perhaps also a citational one (Butler, 1993), where subjects are brought into being through repeated, bodily performance. What emerges from each iteration of the pastoral fold is a relational, multispecies sociality performed through mortuary ritual and thus made material in mortuary space. The living Xiongnu assembled their people and livestock again and again, arranging them into variable configurations that 'rightly' ordered these social beings and the broader world. From this vantage, it appears that the Xiongnu assembled themselves again and again from the bodies up.

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APPENDIX A

TRANSLITERATION AND PRONUNCIATION

Below I list the system used in this project for transcribing Mongolian words (written in Cyrillic primarily from sources dated 1940 or later) into the Latin script. The Latin transcription system I use includes notes on pronunciation when a letter's pronunciation deviates notably from standard English. This system is drawn from Bawden (1997), Atwood (2004), and my own forays into Mongolian-English translation. This system makes no claims of historical depth or relationship between Mongolian terms, pronunciations, etc., that characterize more sophisticated transcription systems (see Atwood, 2004). The Classical Mongolian script (i.e., Mongol bichig) does not factor into the transcription system used in this project, primarily because the Mongolian-language sources (archaeological) all use the Cyrillic system introduced in early mid-20th century Mongolia (in contrast to earlier historical sources).

Cyrillic	Latin transcription	Pronunciation notes
а	a	"ah" as in "father"
б	b	
в	v	often transcribed 'w' (see Atwood, 2004)
г	g	
д	d	
е	ye	
ё	yo	
ж	j	
з	z	like "tz" in "tzatziki"
и	i	
й	i	
к	k	
л	l	
м	m	

н	n	
о	o	like “oh” in “top”
ө	ö	like “eu” in “feu” (see Atwood, 2004: ix)
п	p	
р	r	
с	s	
т	t	
у	u	like “ou” in “ought”
ү	ü	like “oo” in “ooze”
ф	f	
х	kh	like “ch” in German pronunciation of “Bach”
ц	ts	
ч	ch	
ш	sh	
щ	shch	
ы	y	
ь	‘	
э	e	“eh”
ю	yu	
я	ya	

APPENDIX B

GLOSSARY OF TERMS

B.1 Mongolian

Achigch: (ачигч) translates to "loader", "porter", or "baggage-handler" in modern Mongolian (Bawden, 1997; Bolorsoft LLC, n.d.).
Aduuchin: (адуучин) horse herder.
Akhmad: (ахмад) 'elder', 'senior'; also used for the rank of 'captain' in the armed forces (Bawden, 1997).
Aimag: (аймаг) here used solely in modern sense as a Mongolian administrative designation akin to province. See Atwood, 2004, for further disambiguation of *Aimag*.
Ail: (айл) meaning both an encampment or cluster of *ger*, and also "home, family" (Bawden, 1997; Bolorsoft LLC, n.d.).
Airag: (айраг) fermented mare's milk, although *airag* is sometimes produced from other livestock milk. Known in Turkic languages as *Kumiss*/*Kumis*/*Qumis*
Bag: (баг) a subdivision of *sum*. See *Sum*.
Bairtsgüi: (барьцгүй) is a modern Mongolian word for 'elusive, hard to grasp' (Bawden, 1997), generated from the root word барьц (*bairts*). Барьц has two meanings: 1) 'grip, grasp', and 2) 'offering, alm'. While *Bairtsgüi* as the relational osteobiography's title draws predominantly on the first meaning of барьц, the second meaning is not out of place in describing bodily remains deposited in the course of mortuary ritual
Bod Mal: (бод мал) large-bodied livestock: horse, cattle, Bactrian camel
Bog Mal: (бог мал) small-bodied livestock: sheep and goat
Byaruu: (бяруу) *Bos taurus* in its second full year of life (12-24 years of age). See Yearling Cow
Daaga: (даага) a horse 12-24 months of age, or in its second full year of life
Dog' Tolgoi: (догь толгой) "an old hand" (Bawden, 1997). *Dog'* (догь) alone means "seasoned", "experienced" (ibid). See Appendix A for pronunciation of *Dog'* (DOY-g).
Ger: (гэр) 1. mobile dwelling of Mongolian mobile pastoralists, analogous to the numerous incarnations of the Turkic yurt. 2. "home", as in modern apartment or house vs. a physical *ger*.
Khainag: (хайнаг) generic term for the first-generation viable offspring of cows (*Bos taurus*) and yaks (*Bos grunniens*). Female *khainag* are fertile while the males are infertile.
Khaikhramj: (хайхрамж) a modern Mongolian word denoting attention, consideration, and care (Bawden, 1997).
Khangai: (хангай) 1. the Khangai Mountains. 2. the wooded, mountainous ecozone running through the northern and central regions of Mongolia, where many major rivers are located (see Bawden, 1997).
Khavarjaa: (хаваржаа) spring encampment site.
Khos: (хос) "pair, couple" (Bawden, 1997).

Khurgany Uut: (хурганы уут) "lamb bag", a special container used by Mongolian herders to carry newborn lambs and kids born away from the household's encampment back to home safely and warmly.

Khyazaalan: (хязаалан) a horse, cow, yak, sheep, or goat in its fourth full year of life (36-48 months of age). See Bawden, 1997; Erdenetsogt, 2014.

Mal Tuugch: (мал туугч), meaning "drover" or one who drives livestock in modern Mongolian, is a composite of *mal*, the word for animal in the sense of livestock, and *tuugch*, which is often translated as "teamster" or "goadman" (Bolorsoft LLC, n.d.).

Mal Tuukh: (мал туух) meaning "to drive livestock" (Bawden, 1997). See ***Mal Tuugch***.

Malchid: plural of ***Malchin***

Malchin: (малчин) "herder"; Marchina's original reads "(mn. *malcin*; des moutons, br. *honinsin*; de chevaux, *aduusin*)". 'Mn.' denotes Mongolian; 'br.' denotes Buryat. The Mongolian terms using this project's transcription system are: *malchin*/малчин ("herder"); *khon'chin*/хоньчин ("shepherd", lit. sheep herder); and *aduuchin*/адуучин ("horse herder").

Malyn Khot: (малын хот: "livestock town") permanent architecture for sheltering livestock, usually found at *övöljöö*.

Naadam: (наадам) summer festival using centered on the "Three Manly Sports": horseback riding, archery, and wrestling.

Namarjaa: (намаржаа) autumn encampment site.

Nüüdelchin: (нүүдэлчин) 'nomad'. Related to *nüüdel* (нүүдэл: "movement, move, moving": Bawden, 1997; "migration, movement from place to place": Bolorsoft LLC, n.d)

Okhin Shüdlen: (охин шүдлэн) female goat 24-36 months of age

Ortoom – (ортоом) the female offspring of a female *khainag* and male bull (*Bos taurus*) or yak bull (*Bos grunniens*)

- ***Naran Ortoom*** – (наран ортоом) female *khainag*-cow hybrid
- ***Usan Ortoom*** – (усан ортоом) female *khainag*-yak hybrid
- ***Khainagiin Shar*** – (хайнагийн шар) infertile male offspring of a female *khainag* and a bull
- ***Usan Güzee*** – (усан гүзээ) infertile male offspring of a female *khainag* and a yak bull

Övöljöö: (өвөлжөө) winter encampment site.

Saakhalt: (саахалт: "milking partners, neighbors", according to Bawden, 1997) is related to the Mongolian verb "to milk" (*saakh*/саах). A variant of *saakhalt* described in Ahearn, 2021 (and Undargaa, 2007) is *saakhilt ail*. The *saakhilt ail* arrangement as recounted by Ahearn (citing Undargaa, 2007) is made between two encampments dwelling near each other to send their nursing young livestock to the other encampment to prevent them from drinking their mothers' milk during the day and facilitate dairy production. See Chapters 5 and 8

Sarlag: (сарлаг) "yak"; *Bos grunniens* (Bawden, 1997)

Seterlekh: (сэтэрлэх) blessing a single herd animal to stand in as a 'living sacrifice' for the health and wellbeing of its entire herd. See Natasha Fijn's "Mongolian Seterlekh Ceremony" short ethnographic film: https://vimeo.com/143509395

Shüdlen: (шүдлэн) a horse, cow, yak, sheep, or goat in its third full year of life (24-36 months of age). Related to Mongolian words for "tooth" (*shüd*: шүд) and "to grow teeth; to age an animal by its teeth" (*shüdlekh*: шүдлэх). See Bawden, 1997; Erdenetsogt, 2014.

Shüdlen Guna: (шүдлэн гуна) castrated male cow (steer) 24-36 months of age

Shüdlen Günj: (шүдлэн гүнж) female cow 24-36 months of age

Sum: (сум) an administrative district of Mongolia analogous to a county, sometimes written *soum*. Atwood on *sum*: "[f]irst introduced as a militia unit under the Qing dynasty, the *sum* (Middle Mongolian, *sumu*) is now the basic unit of rural administration in both Mongolia proper and Inner Mongolia. *Sum* or *sumu* translates the Manchu term *niru*, "arrow," and designated a militia company…Since decollectivization [in Mongolia] the *sums* have reemerged as a discrete, purely territorial administrative unit. Under collectivization the *sums* were divided into brigades, which have now been renamed *bags*" (2004: 523).

Tavan Khoshuu Mal: (таван хошуу мал) the "five muzzled beasts". The primary taxa herded in present-day mobile pastoral Mongolia: sheep (*Ovis aries*), goats (*Capra hircus*), horse (*Equus caballus*), cattle (*Bos taurus*, *Bos grunniens*, and their various hybridizations: see *Khainag*), and Bactrian camel (*Camelus bactrianus*). Commonly translated as "five snouted beasts". See Five Muzzled Beasts

Tsagaan Sar: (цагаан сар: "white moon" or "white month") Mongolian lunar new year.

Uuurga: (уурга) lasso on a long, rigid wooden pole used by Mongolian herders from horseback or on foot.

Zel: (зэл) a tether line for foals, a long rope erected low and taut, and secured to the ground by pegs at each end. Individual tie lines run from the central rope to each foal, who are positioned alternating, daisy-chain orientation on each side of the central rope.

Zud: (зуд, sometimes *dzud*) is the Mongolian umbrella term for "disaster affecting livestock caused by severe natural conditions" (Bawden, 1997). *Zud* are seasonal catastrophes where ecological and meteorological factors kill off five muzzled beasts, generally due to starvation in winter or spring. See Appendix B.

Zuslan: (зуслан) summer encampment site.

B.2 English

Billy Goat: intact male goat. See Buck.

Buck: intact male goat. See Billy Goat.

Bull: intact male *Bos* sp., usually *Bos taurus*. Can also refer to intact male *Bos grunniens* and Bactrian camels (*Camelus bactrianus*).

Colostrum: the substance produced by mammary glands, including those of domesticated herd animals, during the first 24 hours of lactation (Merck, n.d). Colostrum is unique in its color, viscosity, nutritional density, and centrality to newborn wellbeing by providing crucial antibodies and sustenance.

Cow: female *Bos* sp. who has given birth, usually *Bos taurus*. Can also refer to female *Bos grunniens* and Bactrian camels (*Camelus bactrianus*).

Dam: mother animal

Estrus: receptivity that can lead to impregnation

Ewe: female *Ovis aries*

Five Muzzled Beasts: author's translation of *Tavan Khoshuu Mal* (таван хошуу мал), which refers to the primary taxa herded in present-day mobile pastoral Mongolia: sheep (*Ovis* *aries*), goats (*Capra hircus*), horse (*Equus caballus*), cattle (*Bos taurus*, *Bos grunniens*, and their various hybridizations: see *Khainag*), and Bactrian camel (*Camelus bactrianus*). Commonly translated as "five snouted beasts". See *Tavan Khoshuu Mal*.

Heifer: female *Bos* sp. who has not yet had her first calf

Hogget: a domesticated sheep (*Ovis aries*) in its second full year of life (12 to 24 months of age)

Mare: female *Equus caballus*

Nanny Goat: female *Capra hircus*. Also known as "nanny" or "doe".

Ox: castrated male *Bos taurus*, usually implying an animal used for traction. Plural oxen. See Steer.

Sire: father animal

Steer: castrated male *Bos taurus*

Stirk: see *Byaruu*, Yearling Cow

Weaner Calf: a young cow less than a year old but past the age that it has been weaned; a yearling calf is one year old; weaner calf is under 12 months of age but already weaned from its mother's milk.

Wether: castrated male sheep

Yearling Cow: *Bos taurus* in its second full year of life (12-24 years of age). Also known as "stirk). See *Byaruu*.

APPENDIX C

FIVE MUZZLED BEASTS AND MONGOLIAN MOBILE PASTORALISM

C.1 *Tavan Khoshuu Mal*

In modern Mongolian, *tavan khoshuu mal* translates to “the five snouted animals” or “the five muzzled animals”: cattle, horses, sheep, goat, and Bactrian camels. “Five snouted animals” is the most widely used translation of *tavan khoshuu mal* into English (Bawden, 1997; Bolorsoft LLC) but “five muzzled animals” better reflects the qualities of the nonhuman animals in question. Although “snout” and “muzzle” are roughly synonymous, species-specific usage of the term indicates “muzzle” indicates its apt applicability to the *tavan khoshuu mal*. For example, horses and cows have muzzles, whereas pigs have snouts. Cattle, horses, sheep, goats, and Bactrian camels comprise the nonhuman animal core of modern Mongolian mobile pastoralism; today and historically, these species are fundamental to mobile pastoral lifeways across Inner Asia.

While the phrase *tavan khoshuu mal* comprises cattle, horses, sheep, goats, and Bactrian camels specific to the mobile pastoral contexts of modern Mongolia and adjacent regions, these first four domesticated herd animal taxa encompass an array of breeds across time and space. Modern domesticated horses, cattle, sheep, and goats today exist as numerous breeds that exhibit morphological and behavioral attributes that embody historically-specific intersections of pastoral lifeways, political economies, and ecological settings. Consider the morphological and behavioral spectrum of domesticated horses as seen in Shetland ponies, heavy draft Shires, and American Quarter Horses. Breeds of domesticated sheep and goats vary by their productive focus (i.e., high milk yield vs. rapid weight gain vs. specialized wool or hair), physical appearance, ecological niche (i.e., the hardy, aridity-adapted Awassi sheep vs. East Friesian sheep adapted to cool, damp heathland), and temperament.

Domesticated cattle and equids in Inner Asia include more than one species that can interbreed to produce viable hybrids (see below). It is beyond the scope of this project to reckon with osteological, behavioral, or physiological variations related to breed differences within the same species. However, the above-discussed complications to nonhuman animal categories “horse”, “cattle”, “sheep”, and “goat” should prompt notes of caution in viewing each species as an unvarying homogenous unit.

Today all the five muzzled beasts are herded in Central Mongolia, including the region encompasses the Xiongnu cemetery at Elst Ar. Four of these five species were identified using visual morphological inspection (see Appendix D) at Elst Ar: horses (*Equus* sp.), cattle (*Bos* sp.), and sheep and goat (*Ovis aries* combined with *Ovis/Capra*). No osteological elements were identified as goat (*Capra hircus*), although the presence of domesticated goats at Elst Ar cannot be ruled out, due to the ubiquitous presence of *Ovis/Capra* skeletal remains. The fifth species comprising the *tavan khoshuu mal* is the Bactrian camel (*Camelus bactrianus*). While not identified at Elst Ar, camelid remains likely belonging to Bactrian camels were identified at Züün Salaa, a Xiongnu cemetery in Central Mongolia within the city limits of Ulaanbaatar roughly 200km east of the Xiongnu cemetery at Elst Ar (Hite, 2016).

C.1.1 Horse

The category "horse" does not fully represent the equids encompassed by the taxon "*Equus* sp.". In the archaeological and ecological context in question, *Equus* sp. potentially includes: domesticated horse (*Equus caballus*), domesticated donkey (*Equus asinus*), their hybrids (mules and hinnies), khulan, onager, and *takhi* (Przewalski's horse). All taxa may have been present in Central Mongolia during the Xiongnu period. As discussed in the Chapter 2, Han textual records indicate that the Xiongnu mobile pastoralism included a variety of domesticated equids, raising the question of donkeys and mules at a minimum. Furthermore, available empirical evidence cannot rule out the possibility that some of the equid osteological element identified in the zooarchaeological assemblages from Elst Ar belonged to wild species (i.e., khulan, *takhi*: see Hite, n.d.c). Future research deploying zooarchaeological and molecular techniques for identifying representatives of the genus *Equus* is required to shed light on the question of equids beyond domesticated horses at Elst Ar (and other Xiongnu sites in Mongolia). For a comparison of some of these methodologies and the epistemological framework of species identification within which those methods operate specifically pertaining to the genus *Equus*, see the author's unpublished Master's thesis (Hite, n.d.c).

C.1.2 Cattle

Like the taxon *Equus* sp., the taxon *Bos* sp. encompasses multiple species of large bovids; unlike the taxon *Equus* sp., *Bos* sp. exclusively denotes domesticated cattle. Cattle as a category encompasses numerous domesticated representatives of the genus *Bos*[94], including two species kept by pastoralists in modern Mongolia: cow (*Bos taurus*) and yak (*Bos grunniens*). Cows and yaks are capable of interbreeding to produce viable offspring, despite being different species, and their female offspring are themselves fertile and capable of producing viable offspring with bulls and yak bulls. In modern Mongolia, mobile pastoralists and animal husbandry experts organize the hybridizations of *Bos taurus* and *Bos grunniens* as follows: *khainag* (offspring of a cow and a yak, where the females are fertile but the males are not), *ortoom* [the female offspring of a female *khainag* and a bull or yak bull (*naran ortoom* and *usan ortoom*, respectively)], *khainagiin shar* (the infertile male offspring of female *khainag* and a bull), and *usan güzee* (the infertile male offspring of female *khainag* and a yak bull). All of these cattle are present in modern Mongolia (Erdentsogt, 2014). Like the offspring of horses and donkeys (i.e., mules), cattle hybrids embody the empirical challenges to taxonomic systems imposed upon the living world. The genetic and reproductive intricacies of equid and bovid hybrids are beyond the scope of this project, but emphasize that categorizations of nonhuman animals – whether archaeological, genetic, morphological, or behavioral – are human impositions on a phenomenal (in the Kantian sense) reality.

C.1.3 Sheep and goat

The taxon *Ovis/Capra* reflects the high degree of osteological similarity between sheep (*Ovis aries*) and goats (*Capra hircus*) throughout much of the skeletal system. Zooarchaeological knowledge production wrestles with the practical problems that these morphological similarities

[94]Other examples include gayal (*Bos frontalis*); banteng (*Bos javanicus*); and zebu (*Bos indicus*).

pose, generating an extensive literature of methodologies and interpretative frameworks focused on separating the sheep from the goats (Boessneck et al., 1964). While visual inspection occasionally identified skeletal specimens from *Ovis aries* based on morphological features, no elements could be confidently assessed as *Capra hircus*. Extensive differences exist between sheep and goat in terms of diet and nutritional requirements, health and epidemiological risk factors, and behavior reflect in animal husbandry practices and animal product consumption (Sambuu, 1956; Merck Vet Manual; Erdenetsogt, 2014).

Different breeds of sheep and goats may be classified by their productive emphasis (meat-focused; dairy-focused; wool/hair-focused; mixed use) and present distinctive morphologies and behaviors within a single species.

C.1.4 Bod mal *and* bog mal

The *tavan khoshuu mal* are often subdivided into two classes based on body size: *bod mal* and *bog mal* (Bawden, 1997). The category *bod mal* encompasses the large livestock: horse, cattle (cows, yaks, and their various hybrids; and Bactrian camels. It is unclear whether the reindeer (*Rangifer tarandus*)[95] herded by Turkic-speaking ethnic groups in northern Mongolia (*Tsaatan* or *Dukha*) belong in the *bod mal* category, as reindeer are not part of the *tavan khoshuu mal* (Erdenetsogt, 2014). The *bog mal* category encompasses the small livestock: sheep and goats.

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[95] *Tsaa buga* (цаа буга).

C.2 Seasonality of Livestock Reproduction

C.2.1 Reproductive differences among the tavan khoshuu mal

The reproduction of domesticated herd animals, including the *tavan khoshuu mal* in Mongolian mobile pastoral lifeways, exemplifies how material, bodily interactions are jointly biological and social. Herders manage the breeding of their herd animals, but of necessity work with biological constraints. The reproduction of domesticated herd animals is the fundamental pursuit of herders upon which all mobile pastoral lifeways rely. That reproduction is a joint human-animal endeavor that embodies the insight from living materiality that the social and the biological inherently and inextricably intersect in interspecies entanglements. Thus, the reproduction of herd animals is both social and biological reproduction in a mobile pastoral context. The practices and events that comprise this reproduction operate alone temporal and spatial axes. The seasonal biological constraints on sheep, goats, and horses are a prime example of this millennia-old negotiation. Domesticated sheep, goats, and horses are seasonally polyestrous (Merck n.d), meaning that ewes, nannies, and mares are receptive and fertile multiple times during a limited period of the calendrical year.

Sheep and goat experience estrus (receptivity that can lead to impregnation) as a function of the amount of sunlight per day, meaning that outside of tropical and equatorial climates (and with some variation by breed, especially in modern improved breeds) ewes and nannies/dams usually get pregnant between August and February[96]. Domesticated horses display similar

[96]See the Ohio State University Sheep Team on Fall Lambing (https://u.osu.edu/sheep/2018/07/31/understanding-fall-lambing/), and the USDA-supported Cooperative Extension on Goats (https://goats.extension.org/reproductive-biology-goat-reproductive-physiology/)

constraints due to their seasonal polyestrous reproductive biology[97]. Unlike sheep and goat, who experience receptivity during periods of shorter daylight, horses enter estrous during periods of longer daylight, rendering them "long-day breeders". Mares in the northern hemisphere experience vernal transition marked by variable ovulation (around two months from mid-February to mid-May) until they achieve their true ovulation period (mid-April through mid-September), ceased by a second transition of variable ovulation until reproductive quiescence November through February.

In contrast to sheep, goat, and horses, domesticated cattle are polyestrous without seasonal constraints. One practical implication of these reproductive biological constraints for this project is that the ages of death for subadult specimens of the seasonally polyestrous taxa – horse, sheep, and goat – should be interpreted as more closely tied to season than those of cattle on biological grounds. However, the ages of death for any subadult *tavan khoshuu mal* specimens cannot be straightforwardly and empirically anchored to a calendar using the available dataset generated from the methodologies described in the appendix on bioarchaeological and zooarchaeological methods.

The different reproductive biologies of *tavan khoshuu mal* species shape seasonality assessments. Before culturally-specific economic and political choices about breeding and seasonal animal husbandry practices may be considered, reproductive biology of domesticated cattle, sheep, goats, and horses places different constraints on breeding and dependent mobile pastoral activities (birthing and lactation, required for milking and dairy production). Cattle may breed at any time, unlike sheep, goats, and horses. Thus, calving seasons are not tied to calendrical season by biology in the way that lambing, kidding, and foaling are. In the same

[97]MSD Vet Manual: https://www.msdvetmanual.com/management-and-nutrition/management-of-reproduction-horses/reproductive-cycle-in-horses

archaeological context, subadult specimens from sheep, goats, or horses arguably should be given more weight in seasonality assessment than those from cattle based on said biological constraints.

C.2.2 Livestock reproduction calendars for Mongolia: Sambuu vs. Erdenetsogt

The seasons when herders breed their herd animals and when the resultant offspring are born intensely shape the temporality of mobile pastoral life in modern Mongolia. The herd management practices that manage said reproduction separate *tavan khoshuu mal* by age and species in different pastures depending on the season to facilitate successful long-term strategies of herd animal breeding and maintaining ecological resources (Sambuu, 1945/2001, 1956).

It would be an overreach to directly map modern Mongolian mobile pastoralism onto the Xiongnu at Elst Ar. However, modern mobile pastoralism as practiced in Central Mongolia provides a serviceable ethnographic proxy from which to draw possible interpretations of Xiongnu mobile pastoralism at Elst Ar based on the overlap of *tavan khoshuu mal* species in a common ecological and geographic setting. Acknowledging that exact parallels should not be drawn between modern Mongolia and the Xiongnu, some key ethnographic observations and biological specifics of the *tavan khoshuu mal* in modern Mongolian mobile pastoralism highlight the temporal logics of domesticated herd animal reproduction to this lifeway. The breeding of *tavan khoshuu mal* by Mongolian herders embodies the insight of living materiality that interspecies entanglements comprise deeply imbricated assemblages of the social and biological.

This project uses three sources on Mongolian mobile pastoralism and animal husbandry to explicate some of these details and to anchor seasonality assessments for the Elst Ar graves in an ethnographic framework: three publications by Jamaagiin Sambuu (1945/2000, 1956) and N. Erdenetsogt's 2014 chapter. Sambuu's [*Advice for herders* (1956), and *Tips and instructions given to the people on how to conduct their animal husbandry* (1945)], and N. Erdenetsogt's entry in *Encyclopedia of Mongolian Nomads*, "Animal Husbandry".

Animal	Breeding date	Length of pregnancy	Birthing date
Horse (mare)	Second half of May	11 months, 10 days	Around May 1st of the following year
Cattle (cow)	June 10th start	9 months[98]	Begins around March 10th
Sheep (ewe)	October 10th start	5 months, 5 days	Begins around March 15th
Goat (nanny)	October 20th start	5 months	Begins around March 20th
Camel (cow)	Around January 15th	13 months, 15 days	Begins around March 1st of the following year

Table C.1: Livestock birthing calendar in Mongolia based on Sambuu (1945/2001). Sambuu provided date estimates for the *tavan khoshuu mal* living in the ecological zone between the forested *khangai* and deserts (*khangai-goviin zavsar gazar*) in Mongolia, which encompasses present-day Elst Ar.

[98]Gestation period in modern cows ranges between 279 and 287 days, slightly shorter than Sambuu's (1945) nine-month pregnancy (although Sambuu's timing may reflect the normal range of gestational variation).

Animal	Breeding date	Length of pregnancy	Birthing date
Horse (mare)			April through May (p. 478)
Cattle (cow)	Mid-September	280-285 days	Late February to beginning of May (p. 432)
Sheep (ewe)			Mid-March (p. 363)
Goat (nanny)			Mid-March (p. 363)
Camel (cow)			Mid-March through May (p. 546)

Table C.2: Livestock birthing calendar in Mongolia based on Erdenetsogt (2014). N. Erdenetsogt's entry on *mal aj akhui* ("animal husbandry") in *Mongol Nüüdelchdiin Tailbar Tol'* (2014) presents *tavan khoshuu mal* reproduction dates in Mongolia that differ from those in Sambuu (1945/2001). This 'Encyclopedia of Mongolian Nomads' does not control for region/ecozone in its calendar of estimated breeding, pregnancy, and birthing for the *tavan khoshuu mal*.

APPENDIX D

OVERVIEW OF *RELATIONAL OSTEOBIOGRAPHICAL* METHODS

D.1 Bioarchaeological Methods

Methodologies used in the analysis of human osteological materials came predominantly from Buikstra and Ubelaker's "Standards for Data Collection from Human Skeletal Remains" (1994). Jane Buikstra and Douglas Ubekaler's (1994) manual remains the literal standard for fundamental bioarchaeological analysis. When possible, the following data were generated for human osteological materials at Elst Ar: age at death; skeletal sex; trauma; paleopathological indicators (including degenerative joint disease, oral health, histological reaction); nonmetric traits in the cranial and postcranial skeleton; and unusual morphologies suggestive of intentional modification of the body.

D.1.1 Age-at-death estimates

Bioarchaeologists, forensic anthropologists, and other researchers focused on the human skeletal system have developed numerous methods for estimating the age at which a given individual died based on various osteological traits and features. This project deploys two broad categories of methods for age-at-death estimation: subadult vs. adult. For subadult elements, age at death was estimated based on state of dental eruption, and stages and degree of epiphyseal fusion in the postcranial skeleton when possible. Ages for these different states, stages, and degrees were drawn from the generally-established ontogenetic sequences for dental eruption and epiphyseal fusion (process of endochondral development, or the replacement of cartilage by bone) in Buikstra and Ubelaker (1994). For adults elements, age at death was estimated based on stages of wear in two joints of the pelvic girdle (pubic symphysis and auricular surface) and degree of cranial suture closure. Both the Todd and Suchey-Brooks systems for aging the pubic symphysis were used (see Buikstra and Ubelaker, 1994). The Lovejoy system was used to age the auricular surface (Lovejoy et al. in Buikstra and Ubelaker, 1994). Degree of cranial suture closure as an indication of age at death was scored following the methods laid out in Buikstra and Ubelaker (1994). When possible, age at death was estimated for an individual based on the presence of all ageable osteological features: auricular surface, pubic symphysis, and cranium. Forensic anthropological research indicates that numerous factors impact the features and traits of the human skeletal system linked to age, including sex, socioeconomic status, body size, population affinity[99], and individual variation (see Merritt, 2017, for an overview of this research). Perhaps unsurprisingly, age-at-death estimates derived from multiple methods that target different skeletal traits yield the most accurate estimates (Matrille et al., 2007). Whenever possible, the analyses of this project incorporate age-at-death estimates from multiple traits, and reconciles them into an overall age-at-death estimate.

When both auricular surfaces and pubic symphyses were present and scoreable, the overlap in age ranges for each feature's degree of wear generated the age-at-death estimate. Age at death based on the pelvic girdle was given more analytical weight than when based on degree of cranial suture closure, as these methods have been developed and refined into clear multistage progressions of wear and degeneration of these two joint surfaces in the pelvic girdle linked to

[99]"Population affinity" in bioarchaeological and forensic anthropological terminology is used in an uneasy effort to move beyond biological concepts of race and ethnicity, which played instrumental roles in ugly histories of racist and colonialist models of human variation. However, what "population affinity" and "population" invoke often remains undertheorized and unexplained in bioarchaeological literature.

known chronological age over decades of forensic anthropological and bioarchaeological research (Buikstra and Ubelaker, 1994; Buckberry and Chamberlain, 2002; Matrille et al., 2007; San Millán et al., 2013; Merritt, 2017).

D.1.2 Skeletal sex assessment

Skeletal sex was not assessed for subadult human osteological materials because the ontogenetic factors responsible for sex-influenced morphologies of the human skeleton do not occur until after puberty. Human elements that bore skeletal indicators of ongoing osteological development (i.e., subadults) were excluded from sex assessment, as the hormones responsible for the 'male' traits of an adult human cranium and the 'female' traits of an adult human pelvic girdle are not released into the body until adolescence and may not impact morphology for several years.

For adults, skeletal sex was assessed through the analysis of nonmetric sex-linked traits (Buikstra and Ubelaker, 1994; Klales et al., 2012). In the postcranial skeleton, the following skeletal sex-linked traits of the pelvic girdle were analyzed: greater sciatic notch; ventral arc; subpubic concavity; ischiopubic ramus ridge; and preauricular sulcus. In the cranial skeleton, the following features: nuchal crest; mastoid process; supra-orbital margin; glabella; mental eminence; and gonial angle. The relationships between sex and gender, and between sex and "population", in bioarchaeology, anthropology, and archaeology are too complex to fully explicate here. Suffice it to say that "skeletal sex" is distinct from other characterizations of biological sex (including chromosomal sex), is hypothesized to intersect with gender depending on the given context, and in the following analyses when the gender of a human individual is presented, it should be understood as a plausible interpretation rather than a definitive fact. It cannot be overstated that skeletal sex is not synonymous with biological sex, and that neither are the same as gender. Human osteological materials assessable for bioarchaeological indicators of skeletal sex were scored along a spectrum of "female", "probably female", "possibly female", "indeterminate", "possibly male", "probably male", and "male". No humans reconstructed from osteological materials at Elst Ar could be assessed as definitely "female" or "male" for several reasons. First, cranial features used as indicators of skeletal sex vary by population. Second, cranial and postcranial traits linked to skeletal sex were often absent or damaged by the time osteological materials were available for laboratory analysis. Third, from the perspective of the human skeleton, sex is a composite of morphologies that manifest on a spectrum rather than a binary. Before incorporating critical conceptions of "sex" and "gender", their historical and cultural specificity, and their inherently political natures as concepts, skeletal sex demonstrates the morphological complexity, variation, and range of human biology.

D.1.3 Paleopathological indicators

Qualitative, narrative assessment of paleopathologies for the human osteological materials from each tomb at Elst Ar accorded with the *relational osteobiographical* approach to each context. The methods deployed aimed to generate data that enabled an interpretation of lived experiences in relation to other human and nonhuman animals, rather than a population-level analysis of epidemiological and activity trends. Paleopathological indicators were recorded based on visual inspection. These include: degree of degenerative joint disease (DJD); trauma, including healed and healing fractures; false joints; dental caries; antemortem tooth loss, and resorption of the alveolus; buildup of dental calculus (plaque); and histological reaction of cortical bone suggesting generalized infection of the bony tissue. Indicators of DJD on a given articular surface include: microporosity; bony deposits on the joint surface or its margins; rimming or lipping of the articular surface's margins; inclusions; macroporosity; uneven surface; eburnation; and grooving. Indicators of trauma to human osteological materials were assessed according to methods and typologies laid out in Lovell (1997).

D.1.4 Nonmetric traits and anomalous morphologies

Nonmetric traits in the cranial and postcranial skeleton were recorded following Buikstra and Ubelaker (1994) when observed. Anomalous morphologies of the skeletal system were qualitatively described following Mann et al. (2016).

D.2 Zooarchaeological Methods

D.2.1 Species and taxon identification

Nonhuman animal osteological materials were assigned to species or taxon when possible based on visual inspection. Morphological features diagnostic of the four taxa of *tavan khoshuu mal* present at Elst Ar were used to identify species or taxon: *Equus* sp; *Bos* sp.; *Ovis aries*; and *Ovis/Capra*. These features of each species and the methods used to assess them are standard in zooarchaeological analysis (Silver, 1969; Sisson et al., 1975; Grigson, 1982; Bennet, 2008; Gillis, 2013). Part of the zooarchaeological analysis fundamental to this project was the preparation of a comparative collection of complete horse, cow, sheep, and goat skeletons. This comparative collection was donated to the Mongolian University of Science & Technology (MUST/SHUTIS) for use in the ATRC in Ulaanbaatar following the completion of laboratory analysis in 2016.

The only nonhuman osteological materials identifiable to species rather than taxon or body-size class at Elst Ar were assessed as *Ovis aries*, or domesticated sheep. The other three taxa – *Equus* sp.; *Bos* sp.; and *Ovis/Aries* – could not be confidently assigned a species due to a combination of factors. First, diagnostic morphological features specific to a particular species within each taxon (i.e., *Bos taurus* or *Bos grunniens* within *Bos* sp.) were not observed within the zooarchaeological assemblages at Elst Ar. Second, historical and ethnographic data attest to the presence of multiple wild and/or domesticated species for the *Bos* genus and the *Equus* genus in Central Mongolia (see Appendix C). Third, a significant portion of zooarchaeological research in the Old World has traditionally and continues to study the osteological similarities shared by *Ovis aries* (domesticated sheep) and *Capra hircus* (domesticated goats), developing a substantial zooarchaeological literature on methodologies and analytics aimed to aide researchers in separating the sheep from the goats (cf. Boessneck et al., 1964). However, those shared osteological similarities mean that zooarchaeologists often use the category "*Ovis/Capra*" (or "ovicaprid") to denote elements that could be either *Ovis aries* or *Capra hircus*.

Nonhuman animal osteological materials included taxa beyond the *tavan khoshuu mal* in some mortuary contexts at Elst Ar. Grave 001 included elements from a subadult (i.e., still developing osteologically) ground mammal, likely a member of the Family Muridae (which includes mice, gerbils, and rats). In each mortuary context from Elst Ar, the zooarchaeological assemblage included numerous elements and osteological fragments that could not be identified to species or genus (i.e., taxon), due to a lack of diagnostic morphological features. Some elements could be classified by body size and general morphological features (including: "large bovid"; "small ungulate"; etc.), which includes an extremely broad range of possible nonhuman animals. In Graves 004 and 015, the only nonhuman animal individual minimally present (i.e., nonhuman animal MNI = 1) could be identified to body-size class only (small ungulate and small bovid, respectively). The osteological materials not classifiable by species, taxon, or body size were assessed as "indeterminate".

D.2.2 Skeletal sex

Skeletal sex was assessed for very few nonhuman animal specimens using nonmetric traits (Boessneck et al., 1964; Silver, 1969). Traditional zooarchaeological skeletal sex assessment for primary Old World domesticates (notably sheep, goat, and cattle of the *tavan khoshuu mal*) that uses metric methods requires sufficient sample size to represent a living population/herd and permit regression analysis (Zeder, 2006). *Relatonal osteobiographical* analysis at Elst Ar is incompatible with such a population-based metric approach to sexing.

However, nonmetric traits linked to skeletal sex in specific taxa were recorded when observed. Two of the equid/*Equus* sp. individuals from Grave 001 displayed maxillary and mandibular canines. In horses, canines are very common in male animals (both geldings and stallions) while being infrequent in females (mares).

D.2.3 Age at death

Age-at-death estimates were derived from the degree of epiphyseal closure and the state of dental eruption in nonhuman animal osteological materials when possible. Known sequences of epiphyseal fusion and dental eruption and development in different species (Silver, 1969; Grigson, 1982; Gillis et al., 2013), although zooarchaeological research continues to refine and contest hypothesized sequences of long bone epiphyseal fusion and dental eruption (Zeder, 2006). To wit, Zeder (2006) conducts a rigorous analysis of the relationship between epiphyseal fusion and dental eruption and wear in caprines (i.e., both sheep and goat represented by numerous domesticated breeds and wild relatives). Using novel and published zooarchaeological data, she constructs two compatible systems for ageing caprine postcranial and dental elements. Because Zeder (2006) argues that the empirical basis for previous sheep and goat aging systems rely on flawed empirical grounds, her two systems for organizing caprine postcranial elements into 6-month age brackets and teeth into a more complex scheme of age brackets (see Figs. 31 and 32 in Zeder, 2006). Greenfield and Arnold (2008) persuasively argue that epiphyseal fusion data for nonhuman animal long bones contain a number of analytical disadvantages, including the fuzzy relationship between chronological age and osteological age, the inherent age-cap on the methods (i.e., epiphyses by definition fuse as an individual ages, meaning that older individuals cannot be aged with epiphyseal fusion methods), and taphonomic biases towards the preservation of ‘older’ or fused elements (Zeder, 2006: 837).

Tooth eruption sequences in the *tavan khoshuu mal* are thought by zooarchaeologists to be under tighter genetic control than postcranial osteological development (i.e., long bone epiphyseal fusion), and, along with degree of tooth wear (in some species: sheep and goat), to more accurately reflect chronological age (Greenfield and Arnold, 2008; but see Zeder, 2006). A meaningful engagement with and stance on complex, technical debate are beyond the scope of the current project. However, the zooarchaeological analyses at the core of this project use both epiphyseal fusion and tooth eruption data whenever they could be generated from the available Elst Ar dataset. Age-at-death estimation is key to generating MNI counts for the taxa present in each mortuary context at Elst Ar. Whenever possible, age-at-death estimation for subadult (i.e., still osteologically developing) individuals includes a temporal range within which that individual died measured in months or years. When empirical evidence does not permit the generation of a calendrical age-at-death range, nonhuman animal individuals are termed by extant classificatory schema for each taxon in English and Mongolian (see Appendix C).

D.2.4 Paleopathological analysis

Paleopathological indicators of trauma, infection, and degenerative joint disease were noted for nonhuman osteological materials when present. Indicators of compromised oral and/or dental health include antemortem tooth loss, extreme occlusal wear, dental plaque, empty or resorbing alveoli (tooth sockets left open after antemortem tooth loss providing entry for pathogens into the blood stream), histological reaction of the bony tissue, dental pathologies (notably caries).

Skeletal anomalies presented in the multispecies assemblages include numerous nonmetric cranial and postcranial traits, particularly in human skeletal remains, and ontogenetic asymmetries of uncertain origin. Each relational osteobiography is accompanied by a context-specific appendix that discusses these nonmetric traits and ontogenetic asymmetries as they appear. Burning, staining (likely due to metals), and persistence of other materials, notably red textile adhering to many skeletal elements of Human EA001, were recorded.

D.2.5 Seasonality

One zooarchaeological method for establishing the season in which a given archaeological context was in use or generated is to use age-at-death data from certain nonhuman animals. Age-at-death estimations for *tavan khoshuu mal* can be correlated to domesticated herd animal breeding and birthing schedules to generate a seasonality profile for the mortuary contexts comprising the Xiongnu cemetery at Elst Ar. *Tavan khoshuu mal* breeding and birthing schedules for 20th and 21st century Mongolia taken from Sambuu (1945/2000) and Erdenetsogt (2014)[100] serve as calendrical baselines for calibrating skeletal age at death of young herd animals to seasonal range.

[100]See Appendix C for the two schedules, as well as further details regarding the reproductive biology and seasonality of the five muzzled beasts.

APPENDIX E

GRAVE 001

E.1 Overview of Grave 001

The assemblage of humans and other animals in Grave 001 comprises skeletal remains from at least 17 individuals: an adult human who died over the age of 50 (Human EA01: likely male *Homo sapiens* skeleton); four adult horses (*Equus* sp.: one possible male who died around 13 years of age, one possible male who died at 9+ years of age, and two adults of indeterminate age); five cattle of various ages (*Bos* sp.: one who died between 5-9 months of age, one who died between 8-13 months of age, one who died between 30 and 36 months of age[101], and two adults of indeterminate age); four adult sheep of indeterminate age (*Ovis aries*); two sheep/goat individuals (*Ovis/Capra*: a lamb/kid who died between birth and three months of age[102], and an adult of indeterminate age); and one subadult small ground rodent that likely entered Grave 001 after the initial mortuary rituals and tomb construction.

The subadult small ground rodent (likely a mouse[103] or pika[104]) likely represents an intrusion into Grave 001 at Elst Ar after the initial mortuary rituals and construction of the tomb. However, all the subadult small ground rodent remains were discovered inside one of the adult horse crania (indeterminate adult). It would not be possible to place the rodent inside the horse cranium thusly without a substantial portion of soft tissue (internal and external) having been

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[101]See Appendix 4 in Grigson, 1982.

[102]An age-at-death estimate of 0-3 months for this individual is the most conservative estimate [for a goat/kid from Silver (1969)]. If this individual was a lamb, the most conservative age-at-death estimate would be birth (0) to 6 weeks (1.5 months: Silver, 1969).

[103]Modern Mongolia is home to numerous different representatives of the Family Muridae (which includes mice, gerbils, and rats).

[104] Pallas's pika (*Ochotona pallasi*) or *Mongolyn ogdoi*.

removed. One possibility is that this particular adult horse cranium had been defleshed (by time and/or human labor) before being placed in Grave 001 with the rodent then placed inside it. Another possibility is that the rodent burrowed into Grave 001 long after the soft tissue of the horse cranium had decomposed, entering the brain case and dying there. Therefore, at least 15 individuals (or some of their body parts) were intentionally assembled together during mortuary ritual and the creation of mortuary space (Grave 001) by members of the Xiongnu community at Elst Ar.

Contextual information does not allow reconstruction of individual nonhuman animal bodies; moreover, that more than one human was originally interred in Grave 001 cannot be ruled out. The 2012 Mongolian field report on excavations at Elst Ar indicates that Grave 001 was "looted and robbed"; following Brosseder (2009), this analysis characterizes Grave 001 has having been re-opened after the mortuary rituals that initially assembled Human EA01 and the fifteen nonhuman domesticated animals in the tomb. It is possible that components of the mortuary assemblage in Grave 001, including portions of the multispecies assemblage, were placed there during subsequent intrusions into (as in the case of the young mouse or pika) or reopenings of the grave.

E.2 Contextual Information on Grave 001 from The Mongolian Field Report

Contextual information for Grave 001 according to the 2011 field report. What follows is my translation and light editing of the Mongolian field report (Erdenebold et al., n.d.a) for clarity; ambiguity or my own uncertainty in translation are noted with question marks (?):

“The grave is located in the northern section of the Xiongnu cemetery and has a circular stone surface feature with a diameter of 7 meters. The context was looted. At a depth of 180 cm into the grave cut four horse heads and three cattle heads were unearthed. Under the cattle head(s), a sheep head and bone projectile point were recovered. The wooden coffin enclosed by a stone cist was at 190 cm. At 220 cm the entire wooden coffin was exposed; the wooden coffin is 160cm in length, 66cm wide at the head but 56cm wide at the feet, and 40cm deep. Traces of ash appear outside the left/east[105] wall of the coffin. One horse and one cattle head were discovered on top of the coffin. Beyond the head of the coffin, two horse and one cattle heads were discovered. On the left/east side of the coffin, one small cattle (calf) head and one horse head were discovered. A human skull was discovered next to the calf head. Grave 001 bears signs of looting and robbery. The human skull and mandible were recovered outside of the coffin aligned with the calf head. The remaining human bones were discovered in anatomical position inside the coffin. Some iron small finds were recovered near the human’s left/east foot and leg bones, the human skeleton’s waist, and right/west humerus. Under the left/east and right/west forearms and sacrum archaeologists discovered fragments of silk[106]. Near the human individual’s left/east forearm archaeologists discovered what they interpret as the remains of a fire-starting kit.

“At 230cm deep, three horned sheep heads and one polled sheep head were discovered to the NE of the coffin’s head. The scattered, jumbled placement of nonhuman animal skeletal remains in this area indicated to the excavators that this subcontext resulted directly from looting

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[105]A challenging feature of the Mongolian language when translating into English is that the words for the four cardinal directions – north, east, south, and west – are identical to the words for “back” and “behind”, “left”, “in front of”, and “right”, respectively. When phrases like “left/east” appear in the text, contextual information does not clarify cardinal direction from another positional term.

[106]These fragments may refer to the red textile observed during bioarchaeological analysis of the human osteological materials from Grave 001 and discussed in more detail later in this appendix.

activities, which destroyed the original organization of the tomb. The field report lists the following animal remains by species: four horse skulls (one three- or four-year-old horse[107] and three other fully-grown horses, and possibly an additional three may be reconstructed from cranial fragments?); seven sheep skulls (three of which may be reconstructed from cranial fragments?) distributed between three with horns, three without horns, and one lamb (the six adult sheep crania and cranial fragments were originally organized at/outside the head of the coffin and its left/east side; the lamb skull was found at/outside the foot of the coffin); 14 cranial fragments comprising three cattle skulls[108]" (Erdenebold et al., n.d.a). The 2011 field report suggests that C1 and C2 were originally associated with the animal skulls listed above, along with short ribs (probably first ribs?) and tails (caudal and coccygeal vertebrae?), but that the original organization of the context was lost.

Grave 001 also yielded a number of small finds, including worked bone. Although this worked bone was not available during osteobiographical analysis in Ulaanbaatar, the 2011 field report discusses seven worked bone items recovered from Grave 001 at Elst Ar. Five of these worked bone fragments were identified as a bow's grip. The sixth item is a four-edged projectile measuring 7.2 cm by 1.7 cm, identified specifically as an arrowhead. The final worked bone small find is a nonhuman astragalus (anklebone) bearing a drilled hole. According to the report, "a hole was drilled into the underside of one *bod mal*[109] anklebone, and the anklebone's goat

[107] *Shüdlen* (шүдлэн: 3-year-old) and *khyazaalan* (хязаалан: 4-year-old) are modern Mongolian age classes for horses (see Appendices B and C).

[108] I understand this section to read: "one skull was found at the right/west of the coffin, one skull at/outside the coffin's head, and one on the left/east side of the coffin". However, I am uncertain as to whether the report lists all three skulls are calf skulls or only the skull on the left/east side of the coffin (see Erdenebold et al., n.d.a)

[109] Although this worked bone small find was not available for analysis during osteobiographical laboratory research in Ulaanbaatar, the available photograph indicates it to be a large bovid (most likely cattle) astragalus; equid and camelid may be ruled out based on general morphology. See Appendices B and C.1.4 for *bod mal* vs. *bog mal*.

side[110] (inferior/plantar) bears depressions (or wear?) on the articular surface. However, this astragalus and all other items of worked nonhuman animal bone from Grave 001 were unavailable at the time of analysis, and their existence was not made known to the author until the end of all laboratory work in Ulaanbaatar.

E.3 Humans in Grave 001

E.3.1 Human EA01 overview

The human skeletal material from Grave 1 (approximately 50-75% of a complete human skeleton) comprises a probably male individual who died over the age of 50: Human EA01. A total of 153 human osteological elements were recovered from Grave 001 at Elst Ar and identified during laboratory analysis, including an articulated cranium and the articulated left and right hemispheres of a mandible (*Homo sapiens* n = 153)[111]. It is important to note that the skeletal remains comprising Human EA01 were in fair preservation condition at time of analysis and constituted roughly 75% of a complete human skeleton. These conditions present analytical and interpretive challenges in *relational osteobiographical* analysis discussed below.

The skeletal remains that constitute Human EA01 bear systemic osteological evidence for a life marked by physically traumatic events, heavy workload (biomechanical stress), numerous infections, and yet an amazing capacity for survival. Human EA01 manifests paleopathological

[110]In Mongolian the four aspects of an astragalus (cow, goat, and especially sheep) are termed "goat" (inferior/plantar), "sheep" (superior/dorsal), "camel" (medial), or "horse" (lateral). Divination and games use this terminology, which indicate the symbolic interdigitations of *tavan khoshuu mal* in modern Mongolian mobile pastoralism.

[111]The articulated cranium and the articulated left and right hemispheres of a mandible were each counted as a single osteological element, whereas all teeth (loose and in their alveoli) were counted as individual osteological elements. The osteological element count does not differentiate between complete elements, partial elements, and fragments.

indicators throughout the remaining skeletal materials consistent with numerous infections, cranial trauma, possible cranial deformation (somewhat similar to Human EA04), numerous dental pathologies, and degenerative joint disease in the vertebral column, thorax, pelvic girdle (including antemortem fractures in vertebral column creating false joints), and lower limbs (especially in the knee joints). In other words, Human EA01 lived through numerous relational osteobiographical events and processes that manifested in his skeletal system.

E.3.2 Skeletal sex assessment

Nonmetric skeletal traits from the cranium suggest that Human EA01 was possibly male, while nonmetric skeletal traits from the pelvic girdle indicate a probably male individual. However, paleopathological impacts to the cranium and taphonomic issues in the pelvic girdle necessitate some caution in assessing Human EA01's skeletal sex.

E.3.3 Age-at-death estimation

Age-at-death estimation based on the pelvic girdle used only the pubic symphysis, as no auricular surface was preserved for Human EA01. The pubic symphysis yields an age at death of over 50 years, whereas the degree of cranial suture closure and obliteration as indicators of age suggest a younger skeletal age. The pelvic girdle enables more accurate age-at-death estimates than the cranium. Most importantly, the age-at-death estimate for Human EA01 doesn't establish a cap or ceiling for age-at-death, meaning it is entirely possible that Human EA01 died at any age over 50 years and perhaps was significantly older when he died (Buikstra and Ubelaker). Advanced age would be consistent with the numerous dental and osteological indicators of paleopathology throughout Human EA01's skeletal remains.

E.3.4 Paleopathological indicators in Human EA01

Below a descriptive account of paleopathologies observable in the osteological materials constituting Human EA01 begins with the cranium and proceeds distally through the axial skeleton and on into the appendicular skeleton, finishing with the lower limbs. Overall Human EA01 manifests signs of degenerative joint disease (DJD) and histological reaction (a generalized response of living osteological tissue that often indicates microbial infection) throughout the skeleton, possible traumatic events impacting the cranium, vertebral column, ribs, and pelvic girdle, numerous dental pathologies, and unusual cranial morphology.

E.3.4.1 Cranium

The human cranium associated with Human EA01 displays evidence of two traumatic incidents to the left vault (at the zygomatico-temporal suture and on the parietal at bregma). The zygomatioc-temporal suture trauma appears healed antemortem, where the trauma apparent on the left parietal near bregma presents a more complex diagnosis. The left parietal displays two fractures intersecting at almost 90 degrees, with the trauma at bregma healing but not healed and radiating inferiorly and posteriorly to sphenoid and lambdoidal sutures. It is possible that the traumatic event to the left parietal led to Human EA01's death; it is more accurate to say that this cranial trauma did not finish healing before his death. Another incident of trauma impacted

Human EA01's cranium before death that depressed his right nasal and frontal process of the right maxilla into the nasal cavity. It is possible that this traumatic event introduced the infection manifested by bilateral histological reaction at glabella on both superciliary arches. Small osteomas mark the superior aspect of the frontal.

At several sites on the articulated cranium, Human EA01 presents very unusual morphology not clearly associated with trauma or disease: bilateral depressions at the ectocranial surface of the sphenoid's greater wings; overall asymmetry of cranium, where the left hemisphere is antero-posteriorly elongated compared to the right. Causes of these morphologies are unknown.

Human EA01 experienced extensive antemortem tooth loss; at his death, Human EA01 retained only three teeth in his upper jaw (LM^1, RM^1, RM^2) and six teeth in his lower jaw(LP_3, L/C, R/C, RP_3, RP_4, RM_1) teeth. All remaining mandibular teeth exhibit heavy occlusal (biting surface) wear; L/C, LP_3, and RM_1 are worn so extensively that almost no crown remains for these teeth.

The empty sockets (alveoli) for the lost maxillary teeth resorbed and remodeled before Human EA01's death. The remaining maxillary left and right first molars and right second molar display significant occlusal wear. Plaque/dental calculus accumulated on labial, lingual, buccal, and occlusal surfaces, as well as between teeth and on exposed tooth roots of all remaining maxillary teeth. Human EA01's mandible manifests a similar state of dental and oral health. The left mandibular canine, left lower third premolar, and left upper first molar are so extensively worn that almost no crown remains. Plaque/dental calculus accumulated on all remaining mandibular teeth, but not to the extent observed in the maxillary teeth. Where mandibular teeth were lost antemortem, remodeling of the alveoli and mandibular corpus was underway at the time of death; the corpus is significantly reduced where antemortem tooth loss occurred. The alveoli for the mandibular left cheekteeth (LP_3-LM_3) and mandibular right second and third molars where remodeling yet still open. These sites represent possible avenues of infection throughout body, cranium, and mandible in particular (bilateral signs of histological reaction on medial/lingual surfaces of left and right mandibles that spread posteriorly to the coronoid process).

E.3.4.2 Vertebral column

Human EA01 presents extensive osteological indicators – osteolytic activity – of paleopathology throughout the cervical, thoracic, and lumbar vertebrae, and the sacrum. Notably, a left rib fused to an indeterminate thoracic vertebra where the rib head and tubercle articulate with the vertebra's transverse process and costal facet (evidence that this rib head and tubercle also fused to the thoracic vertebra immediately inferior to this one, i.e., the one that articulates with it). T12 and L1 (the final thoracic and first lumbar vertebrae) fused along their vertebral bodies and posterior articular facets (the superior and inferior articular facets) at some point, most likely as a result of physical trauma rather than congenital factors. In one of the lower lumbar vertebrae (likely L5), the neural arch/lamina is separated from the vertebral body but presents signs of articulation at the separation. This presentation is likely bilateral spondylolysis, a type of repetitive stress injury to the vertebra today seen in certain kinds of athletes[112], although congenital articulating neural arch is potentially possible (Mann et al., 2016). Thus, the paleopathological indicators in this lower lumbar vertebra are the result of trauma, infection,

[112]See Appendix G (Grave 012) for further discussion of spondylolysis and its occurrence in modern populations described in Mann et al. (2016).

and/or joint degeneration. In the lumbar vertebrae overall, Schmorl's nodes, less severe endplate lesions (Mann et al., 2016), and vertebral body compression appear throughout and increase inferiorly down the vertebral column. Some vertebral body compression in the thoracic and cervical vertebrae, but not to an extent comparable to the lumbar vertebrae. Indicators of degenerative joint disease mark a variety of articular surfaces throughout the vertebral column (including sacrum and coccyx). The fusion of vertebral bodies and of a rib with thoracic vertebrae indicates that Human EA01 experienced at least one instance of major physical trauma, whereas the Schmorl's nodes, degenerative joint disease, and compression in vertebral bodies likely result from long-term biomechanical 'work' or load-bearing and strain.

Similar osteological evidence of a hard life occurs throughout Human EA01's appendicular skeletal remains. The remaining elements in Grave 001 comprising the upper body of Human EA01 were extremely brittle and fragile by the time they had been stored in the ATRC facilities in Ulaanbaatar.

E.3.4.3 Thorax

The left and right clavicles manifest degenerative joint disease and bony deposits on their medial and lateral aspects (i.e., sites of articulation at the manubrium and scapula, respectively). The acromial articular facet of the left clavicle exhibits eburnation. The inferior aspect of the medial portion of the right clavicle shows possible infection in the form of a hole or large inclusion. Fragmentary remains of red, or possibly brown, textile adhere to the superior aspect of the lateral right clavicle. The manubrium and sternum exhibit severe and extensive degenerative joint disease and ossification of cartilaginous tissue. Extreme levels of bony deposition mark the articular facets on the manubrium for the left and right first ribs, to the extent that the right first rib is fused to the manubrium through ossification of cartilaginous tissue and extreme bony deposition. Inferior to this fusing of the right first rib and manubrium, extreme levels of bony deposition mark the area superior to sites of articulation for the right second rib The third costal facets on the left and right aspects exhibit even, bisecting gaps: possible infection/disease, or ossifying cartilage? On the anterior aspect of the sternum, bony deposits appear at costal articular sites for ribs 4-6 and further degenerative joint disease.

The postdepositional breakage of the ribs from Grave 001, presumably all from Human EA01, and related taphonomic issues (including archaeological recovery and storage of human remains) post challenges for interpreting these elements. No complete ribs remain from Human EA01, aside from the left first rib, and all ribs 3-12 (left and right) exist now only in fragments. However, over 85% of those rib fragments manifest signs that Human EA01 lived a life marked by at least one major traumatic event, hard work in the form of load bearing and/or high activity levels over a long period of time, and at least one battle with infection that ended in Human EA001's defeat (with his death). Of the 42 human rib fragments (ribs 3-12) recovered from Grave 001, eight of those manifest healed fractures (19%), 21 manifest signs of degenerative joint disease and/or bony deposits ONLY (50%), and seven fragments present healed fractures, signs of infection (major holes/inclusions due to infection = 2-3 rib fragments), AND degenerative joint disease (roughly 16.7%).

E.3.4.4 Upper limbs

Little remains from the left and right scapulae of Human EA01. The only remaining glenoid fossa (from the right scapula) manifests numerous indicators of degenerative joint disease: an irregular, uneven articular surface for the right humeral head; rimming and lipping of that articular surface that includes some bony deposits (most evident in the antero-inferior aspect).

In addition to the left rib fused at its head with two thoracic vertebrae (see above), Human EA01's manubrium and sternum display osteolytic activity, particular at sites where they articulate with the first right rib. The left and right humeri display signs of degenerative joint disease on all articular surfaces that survived postdepositional and taphonomic processes. While the right humeral head was not preserved, the left humeral head exhibits extreme signs of degenerative joint disease: some eburnation, degraded articular surface to the point of unevenness and granularity; and irregular bony deposits around the margins of the articular surface that extend down onto the neck of the left humerus. Degenerative joint disease (DJD) marks the distal articular surfaces of the left humerus, with bony deposits around the trochlea. The head of right humerus was absent at the time of analysis. The distal aspect of the right humerus displays numerous indicators of DJD: degradation of the articular surface of the trochlea and capitulum; histological reaction appears on the posterior aspect of the distal humerus's medial and lateral condyles.

The left and right ulnae display very similar indicators of DJD on their proximal and distal articular surfaces in the form of minor lipping at margins of those surfaces and irregular surfaces. Microporosity, an indicator of DJD, marks the posterior aspect of the head of the left radius; the articular surfaces of the distal aspect of the left radius show eburnation, microporosity, and some minor lipping around the edges of those surfaces. DJD also appears on the right radius. Microporosity and roughening/unevenness of the superior articular surface mark the head of the right radius, whereas roughening/unevenness of the articular surfaces and minor lipping of those surfaces that includes bony deposits appear on the distal aspect of the right radius.

Human carpals, metacarpals, and proximal, intermediate, and distal phalanges recovered from Grave 001 display indicators of DJD across their articular surfaces: bony deposits around the margins of articular surfaces; rough and uneven articular surfaces; and eburnation in the articular surfaces of the carpals. Histological reactions appear on three bones in the right hand: the right hamate, right lunate, and right triquetral.

Fragments of red textile (mentioned above) adhere to the left and right arm bones, as well as to the dorsal surface of a first phalange.

E.3.4.5 Pelvic girdle

Human EA01's pelvic girdle is unfortunately in an extremely brittle and degraded state. However, a major bony deposit/ossification posterior to the superior aspect of the left auricular surface (for articulation with the sacrum) suggests another barrier to full mobility (the postmortem state of the sacrum does not preserve this, as the sacrum was in four pieces and is thus incomplete). Visual inspection did not clarify whether this ossification was woven bone or histological reaction. The articular surface for the sacrum's centrum and the inferior centrum of L5 exhibits major degenerative joint disease in the form of porosity, uneven articular surface, and bony deposits around the anterior centrum rim.

Bilateral histological reaction marks both acetabula in their exact centers, spreading onto the lunate surface as well as nonarticular surface. Concordant paleopathological indicators should occur bilaterally at the site of articulation with each leg (i.e., in the femoral heads: see below for detailed discussion). The lateral margins of the acetabular lunate surface exhibit lipping, more marked in the right than left acetabulum. The auricular surface of the left ilium bears a major ossification (bony deposit) at its superior-posterior aspect. The left articular surface for the auricular surface on the sacrum should manifest a mirror feature, but that portion of Human EA01's sacrum is absent/damaged postdepositionally. The bony deposit could be either histological reaction or woven bone, which may have resulted from dislocation of the left sacro-auricular joint. The bony deposit's existence on this joint surface would likely have been painfully and may have adversely impacted Human EA01's mobility.

E.3.4.6 Lower limbs

The articular surface of the head of the left femur is rough and uneven. Histological reaction marks the fovea capitis (and thus consistent with the signs of histological reaction in the left acetabulum described above), and the anterior aspect of the greater trochanter. Moving distally from the femoral head, an ossified nodule appears in the medial depression of the greater trochanter. Extremely rugose and heavy muscle attachment sites mark the gluteal and spiral lines and linea aspera, indicating high levels of biomechanical work undertaken by the upper legs. The left femor's linea aspera at the medial aspect and midshaft has projecting spurs that are likely ossifications of ligamentous attachment. The rugosity of the gluteal and spiral lines and linea aspera also includes signs of histological reaction. There is a postmortem cut into the medial condyle of the left femur (probably a shovel or trowel). Both left femoral epicondyles display histological reaction. Thick, uneven rimming in significant amounts of the distal articular surface (for the proximal tibia) indicates degenerative joint disease, which is further supported by microporosity on the lateral articular surface and bony deposits and histological reaction on the medial articular surface.

The articular surface of the head of the right femur is worn to the point of some microporosity, and histological reaction appears in the fovea capitis (consistent with histological reaction seen in the right acetabulum). The state of proximal and midshaft muscle attachments (including lines) in the right femur is similar to that observed in the left femur, but no ossified spurs appear (as did on the linea aspera of the left femur), and histological reaction on these rugose surfaces is more evident. The medial aspect of the right femur's distal articular surface is marked by a postmortem cut (probably a shovel or trowel). Some degree of histological reaction appears on all four aspects of the right femur's distal end. The right femur's distal aspect is almost identical to the state of the left femur's distal aspect.

The left tibia shows degenerative joint disease in the proximal articular aspect. Its tibial plateau's medial aspect of the articular surface is marked by eburnation and microporosity. Bony deposits and lipping mark the margins of the tibial plateau. Some degree of possible histological reaction appears on all four aspects of the proximal tibia. The soleal line is heavy, rugose, and marked with histological reaction. All four aspects of the distal left tibia show histological reaction. The left tibia's distal articular surface is rough and marked with a few small bony deposits.

The right tibia shows degenerative joint disease in the proximal articular aspect. Its tibial plateau displays eburnation on its lateral aspect, and microporosity on the lateral and medial aspects. Major lipping appears around the entire tibial plateau, with some bony deposits at the antero-medial aspect. As in the left tibia, histological reaction appears in the proximal right tibia, including the soleal line. The anterior margin of the right tibia's shaft is marked by mild histological reaction. The distal articular surface of the right tibia is rough, and all four aspects of the distal right tibia display histological reaction. Some small, uneven bony deposits mark the medial aspect of the right tibia's distal shaft.

The left and right fibulae present very similar morphologies. Uneven bony deposits mark the anterior aspects of each fibula's shaft. Histological reaction appears on both shafts' proximal aspect, and the surface of each fibula's proximal articular facet is rough due to microporosity.

Of the bones of the feet that remain for Human EA01, the preserved articular surfaces generally display rough and uneven surfaces, with a few marked by bony deposits. In particular, the articular surfaces of one navicular and one talus display natural holes, almost like Schmorl's nodes, which likely indicate an extreme stage of degenerative joint disease.

E.4 Nonhuman Animals in Grave 001

E.4.1 Nonhuman animal overview

Just under 30% of the nonhuman osteological materials recovered from Grave 001 at Elst Ar and subsequently stored in the ATRC/SHUTIS collections facility in Ulaanbaatar were identifiable to species or genus: *Ovis aries* (0.9%), *Ovis/Capra* (5.3%), *Equus* sp. (15.6%), and *Bos* sp. (7.3%). Whether the Xiongnu assemblers at Elst Ar and across the imperial sphere of influence on the Mongolian Plateau treated sheep differently than goats in mortuary ritual remains is an open question requiring more extensive empirical evidence to address. At Elst Ar, only Graves 001 and 022 yielded osteological materials that could be identified at *Ovis aries* (rather than *Ovis/Capra*); whereas *Ovis/Capra* remains were identified in Graves 001, 013, 015, 020, 021, and 022.

The small number of elements from Grave 001 identifiable to taxon or size class made it possible to estimate Minimum Number of Individuals (MNI: Lyman, 1994) for more than one element, then to cross-reference those estimates to generate a more refined MNI assessment. This approach could account for age-at-death and skeletal sex, possibly yielding an overestimate of nonhuman animal MNI (Lyman, 1994). Skeletal sex assessment of nonhuman animal osteological materials from Grave 001 was only possible for equid cranial remains that comprised two individuals: one who died around 9 years of age, and one who died around 13 years of age. Both individuals were assessed male based on the presence of maxillary and mandibular canines. Skeletal sex assessment was not possible for any other nonhuman animal osteological materials excavated from Grave 001. No unfused epiphyses, fusing epiphyses, deciduous teeth, or erupting teeth were identified among the *Equus* sp. remains from Grave 001. Age-at-death estimates for all *Equus* sp. osteological materials were based on stage of dental eruption and wear (Silver, 1969; Bennett, 2008).

The three subadult *Bos* sp. individuals were aged based on the state of dental development and eruption of more than one tooth from the same mandible or maxilla (see Appendix 4 in Grigson, 1982). One subadult *Bos* sp. individual died between 5 and 9 months of age (left and right first molars erupting, with crypt perforation for the left second molar), and was thus a calf. The second died between 8 and 13 months of age (left first molar in occlusion and left second molar in crypt), and was thus a weaner calf or young yearling. The third individual died between 30 and 36 months of age (right upper second premolar not erupted but right third molar in occlusion), making it an adult cow with a still-developing skeletal system.The fetal/infantile *Ovis/Capra* individual age assessment derives from the dental eruption pattern of deciduous cheekteeth in left and right mandibles (dP_2, dP_3, and dP_4). In this individual, dP_2 is still erupting and not yet in full occlusion (unlike the fully-erupted dP_3 and dP_4). Silver (1969) assigns eruption of the deciduous cheekteeth in sheep (*Ovis aries*) to present at birth through first six weeks of life; in goats (*Capra hircus*) to present at birth through the first three months of life. In contrast, the Merck Veterinary Manual[113] lists deciduous cheekteeth as erupting by birth to 4 weeks of age. Modern veterinarians disagree as to whether deciduous teeth are present at birth in sheep and goats (Merck Veterinary Manual). For a late Iron Age population from Central Mongolia, these analyses assume relatively slower patterns of dental eruption and overall skeletal development and maturation compared to modern improved sheep and goat breeds (Silver, 1969; Zeder, 2006). In the case of the fetal/infantile *Ovis/Capra* individual (lamb or kid) from Grave 001, that its dP_2 are still erupting may indicate age proximity to the earlier period of deciduous cheekteeth eruption. In other words, the lamb or kid died closer to birth than to six weeks/three months because the tooth was not yet fully erupted or in occlusion).

E.4.2 Paleopathological indicators

One horse older than 12 years of age at the time of its death displays histological reaction bilaterally in the left and right mandibles posterior to M/3 (EAZ1-0415 and EAZ1-0416). A

[113]Entry in Merck Veterinary Manual: https://www.merckvetmanual.com/digestive-system/dental-development/estimation-of-age-by-examination-of-the-teeth#v4719661

second possibly male horse (EAZ1-0434, EAZ1-04) manifests histological reaction in an empty tooth socket (crypt for RP2/) that suggests it had been lost relatively recently antemortem.

One adult *Bos* sp. (two elements: (EAZ1-0238 and EAZ1-0238) displays histological reaction bilaterally along the lingual gumline of left and right maxillae at cheekteeth. At least one adult *Bos* sp. appears to be significantly larger than the other *Bos* sp. individuals, based on extremely robust and large-in-size proximal (3), intermediate (1), and distal phalanges (1); this last element is more than 50% larger than the modern *Bos* sp. comparative specimen's distal phalange. The *Ovis aries* C2 is also more robust than that of the modern comparative specimen. One *Ovis aries* adult cranium and one *Ovis/Capra* (apparently) adult cranium both have small bumps on the frontals where the horn cores should be. Such presentation may be evidence of semi-successful dehorning and subsequent horn regrowth, although further research will be required to assess this possibility.

In what likely represents a postdepositional intrusion into Grave 001, a subadult (still growing osteologically) rodent (likely pika[114] or mouse) burrowed into an equid cranium (EAZ1-0434) represented by eight postcranial elements.

E.4.3 Seasonality profile

The age-at-death estimations for certain osteologically subadult *tavan khoshuu mal* elements discussed above were used to generate a seasonality profile for Grave 001. The fetal/neonate *Ovis/Capra* individual (lamb or kid) died between birth and 3 months of age; the three cattle died at 5-9 months (calf), 8-13 months (weaner calf/young yearling), and 30-36

[114]Pallas's pika (*Ochotona pallasi*; *Mongolyn ogdoi*).

months , respectively. Following Sambuu's (1945/2000) *tavan khoshuu mal* breeding and birthing schedule[115], the Xiongnu community at Elst Ar engaged in the mortuary practices that generated Grave 001 between mid-March and mid-May. However, the age-at-death estimated range for the calf puts the calf's season of death outside of this range, putting the seasonality profile for Grave 001 based on Sambuu's schedule in question. As discussed in Appendix C, the reproductive biology of cattle facilitates a more temporally-flexible birthing calendar when compared to sheep and goats. This may explain the discrepancy between the calf's season of death and the season of death for the other three subadult *tavan khoshuu mal*.

In contrast, when the age-at-death estimates for the lamb or kid, calf, weaner calf/young yearling, and 30 to 36-month-old cow are correlated to Erdenetsogt's (2014) *tavan khoshuu mal* breeding and birthing schedule, the seasonality profile for Grave 001 shifts to the month of March. This is partly because Erdenetsogt (2014) uses a wider temporal span for cattle birthing (late February through the beginning of May) in Mongolia compared to Sambuu (1945/2000). Compared to the Grave 001 seasonality profile calibrated to Sambuu's schedule, the Erdenetsogt-calibrated seasonality profile sees the estimated age-at-death timeframe for each of the four subadult *tavan khoshuu mal* overlapping (in March).

E.4.4 Evidence of burning

Roughly 2.5% (combined fragment and element/specimen count, n=1457) of the Elst Ar osteological assemblage manifests dark discoloration suggestive of burning. Dark discoloration appears only in some genera and body-size classes in Grave 001. Dark discoloration is notably

[115]See Appendix C.

absent from all *Homo sapiens*, Rodent (Ground mammal/rodent), *Ovis aries*, and *Equus* sp. osteological materials. Dark discoloration is thus present in *Bos* sp. (4.26%), *Ovis/Capra* (13.04%), Horse/Cattle (*bod mal*) body-size class (2.73%), Sheep/Goat (*bog mal*) body-size class (8.62%), and Other/Indeterminate (1.42%). The limited contextual/depositional information about the multispecies assemblage in particular and the mortuary context more generally render interpretations of discoloration (as evidence of burning) difficult. The Mongolian-language excavation report suggests that burning was localized within the mortuary space: traces of ashes were identified after a depth of 220 cm on the east (or perhaps left, see previous footnote on Mongolian directional terms) side of the coffin. However, the archaeological finds retrieved from this location according to the report do not bear evidence of burning; specifically, the nonhuman animal elements listed as the skull of a calf and the skull of a horse show no discoloration. No discoloration of these kinds was observed on the human skeletal remains from Grave 001. Evidence of burning has been reported in other Xiongnu tombs in Mongolia and southern Siberia, and has been interpreted to be one component of complex rituals that comprised Xiongnu mortuary practice (Brosseder, 2009).

E.4.5 Textiles on bone

Fragmentary remains of an unidentified red textile coated portions of the posterior and anterior arm bones (and dorsal surface of one first phalange) belonging to Human EA01. These fragments of red textile could be what the Mongolian field report referred to as “silk” adhering to the human arm bones from Grave 001.

APPENDIX F

GRAVE 022

F.1 Overview of Grave 022

Grave 022 contained a minimum of 13 individuals: one human who was of indeterminate skeletal sex but possibly of female skeletal sex and died between 35 and 40 years of age, and one human of indeterminate skeletal sex and age at death (*Homo sapiens* MNI = 2 according to osteobiographical analyses performed in the laboratory); three horses; three cattle; one sheep; and four sheep/goats. The eleven nonhuman animal individuals interred in Grave 022 included a young foal; a colt or filly; a yearling or stirk (i.e., cattle in their second full year of life); an adult ram; a lamb or kid; two adult sheep or goat of indeterminate age, and a subadult sheep or goat of indeterminate age. Grave 022 is thus one of only two Xiongnu mortuary contexts at Elst Ar analyzed in this project that contains individuals from all taxa identified in zooarchaeological analysis: *Equus* sp.; *Bos* sp.; *Ovis aries*; and *Ovis/Capra*. Grave 022 also has one of the highest counts of minimum number of combined human and nonhuman animal individuals (MNI = 13) at Elst Ar, and is one of four double human burials.

F.2 Contextual Information on Grave 022 from The Mongolian Field Report

According to the 2013 field report on 2012 excavations at Elst Ar, Grave 022 is a 10 m by 9 m circular stone surface feature in the northern section of the Xiongnu cemetery

(Erdenebold et al., n.d.b). After cleaning the surface feature, excavators encountered the *tolbo*[116] at a depth of 2 m. At 2.2 m excavators revealed human and nonhuman animal bones: human tibiae (completeness and count not specified) or possibly lower limb shaft bones, and *bod mal* paired innominates, forelegs, hindlegs, and phalanges (count implied but not specified; completeness not specified)[117]. The photograph of Grave 022 at this depth (see Erdenebold et al., n.d.b: 46) shows some of these skeletal elements: two equid metapodials with splint bones are unambiguous, while what appear to be two equid innominates, femora, and tibiae (one with the calcaneus still in anatomical position) are pictured at the same level. This taken together with the osteobiographical analyses conducted on the skeletal materials labeled Grave 022 stored in the ATRC collections facility in Ulaanbaatar strongly suggest that a pair of articulated horse hindlimbs were interred at the *tolbo* over Grave 022.

Excavators uncovered a stone cist enclosing a wooden coffin at 2.6 m, inside of which numerous human skeletal elements were discovered in disarray[118]. However, the lower legs appeared in anatomical position. The field report notes that the organization of nonhuman animal remains in Grave 022 resembles that of Grave 020 (the report goes further and calls it 'identical'): nonhuman animal bones and broken ceramic vessels outside of the stone cist, and a nice to the northwest of the cist housing nonhuman animal ribs and vertebrae. Excavators hit sterile soil at 2.7 m. Grave 022 was robbed and thus its original organization is lost. The 2013 report indicates that no small finds were found in Grave 022. However, as discussed below in the section on Worked nonhuman animal bone, osteobiographical analysis of the zooarchaeological assemblage from Grave 022 at Elst Ar identified 15 fragments of worked

[116]Here *tolbo* (толбо) refers to the soil color change indicating the gravecut.
[117]The report records "бод малын хос шүүж, урд, хойд мөчдийн хос чөмөг, тагалцагны яснууд илэрч байлаа".
[118]No visual record of the wooden coffin or stone cist within Grave 022 exists in the 2013 report.

nonhuman animal bone. Fourteen of these fragments highly resemble the bone components of archery equipment (bow supports) found in other Xiongnu mortuary contexts (see Chapter 3). The fifteenth worked nonhuman animal bone artifact from Grave 022 is an ungulate (bovid?) astragalus with edges smoothed down and a single circular perforation; the astragalus is too large to be *Ovis/Capra* but too small to be *Bos* sp., and diagnostic osteological features have been obliterated by working the bone into its present form.

F.3 Humans in Grave 022

F.3.1 Overview of Human EA16 and Human EA17

193 human skeletal remains were identified from the osteological materials recovered from Grave 022 at Elst Ar (*Homo sapiens* n = 193)[119]. The co-mingled nature of these materials as encountered during the initial excavation (Erdenebold et al., n.d.b) and subsequent storage in the ATRC collections facility make reconstruction of human individuals from osteological materials and estimation of skeleton completeness highly challenging.

Osteological elements from a minimum of two human individuals were interred in Grave 022 at Elst Ar: Human EA016 and Human EA017 (*Homo sapiens* MNI = 2). The *Homo sapiens* MNI derives from the presence of numerous duplicate upper and lower limb osteological elements: two right humeri, two right radii, two right femora, two left tibiae, two right tibiae, two right fibulae, two left capitates, two left fifth metacarpals (MC5), two left calcanei, two right calcanei, two left tali, two right tali, two left cuboids, two right cuboids, two right naviculars, two

[119]Complete, partial, and fragmentary human osteological elements were counted together, along with all teeth found loose or still in their alveoli.

left 1st/medial cuneiforms, two right 1st/medial cuneiforms, two left 2nd/intermediate cuneiforms, two right 2nd/intermediate cuneiforms, two left 3rd/lateral cuneiforms, two right 3rd/lateral cuneiforms, two left 1st metatarsals (MT1), two right MT1s, two left 2nd metatarsals (MT2), two right MT2s, two left 3rd metatarsals (MT3), two right MT3s, two left 4th metatarsals (MT4), two right MT4s, and two right 5th metatarsals (MT5). Aside from these osteological elements, it is challenging to assign specific osteological elements to one individual (Human EA016) vs. the second individual (Human EA017) when those elements manifest no traits and features associated with skeletal sex or age at death. However, the single right human innominate (articulated ilium, ischium, and pubis broken postmortem) recovered from Grave 022 was in suitable condition for skeletal sex assessment and age-at-death estimation methods applied to the pelvic girdle (see below); these analyses yielded osteobiographical data on Human EA016, an individual of indeterminate skeletal sex although possible skeletally female (see below) who died between 35 and 40 years of age. The single complete human mandible with three permanent teeth in their alveoli does not yield sufficient bioarchaeological data to assign to Human EA016 vs. Human EA017, being that of a skeletally adult individual.

However, numerous "duplicate" osteological elements from Grave 022 manifest obvious differences in size and robusticity, providing further evidence for the presence of two human individuals in that context. These elements are upper limb, lower limb, and foot bones (discussed in more detail in the *Paleopathological indicators* section below) that sort between larger and more robust elements vs. smaller, gracile elements.

F.3.1.1 Skeletal sex assessment

One complete right innominate (articulated ilium, pubis, and ischium) bearing some postmortem damage was found in Grave 022. These elements preserved osteological traits and features that facilitated assessment of skeletal sex using bioarchaeological methods deployed in this project (Buikstra and Ubelaker, 1994; Klales et al., 2012). The traits and features of the pelvic girdle analyzed were: greater sciatic notch; ventral arc; and ischiopubic/medial ramus ridge. Moreover, a preauricular sulcus – an osteological trait generally scored as skeletally female (Buikstra and Ubelaker, 1994; Mann et al., 2016) – was observed on the ilium. The scoring of these traits and features yielded a skeletal sex assessment of "indeterminate" with a slight tendency to female skeletal sex. A conservative bioarchaeological approach would categorize Human EA016 as having an indeterminate skeletal sex based on features of the pelvic girdle. As discussed at length in the following section and in the *Paleopathological indicators* section below, morphological changes to this right ilium and the sacrum (and lower vertebral column to which it articulates) from Grave 022 appear in the auricular surface. Moreover, variant osteological features appear around the greater sciatic notch of the right ilium, which is one of the traits used to assess Human EA16's skeletal sex. It is difficult to assess whether the major morphological changes to the pelvic girdle and lower vertebral column effected the presentation of this right ilium's greater sciatic notch. The possibility exists and therefore merits a cautious interpretation of this trait vis-à-vis skeletal sex assessment. This articulated right innominate was subjected to bioarchaeological methods for estimating age at death (see below).

F.3.1.2 Age-at-death estimation

The articulated mandible from Grave 022 contains three adult teeth in full occlusion and exhibiting wear: RP_3, RP_4, and RM_1. Thus, the mandible yields no empirical basis for assigning it to Human EA016 vs. Human EA017.

The articulated right innominate preserved the two joint surfaces (pubic symphysis and auricular surface) to which this project's methods of age-at-death estimation were applied: Todd and Suchey-Brooks, respectively, for the pubic symphysis, and Lovejoy et al. for the auricular surface (Buikstra and Ubelaker, 1994). Correlating the three age-at-death estimations from the different methodologies indicates that Human EA016 died around 40 years of age based on features and traits of the pelvic girdle. This overall age-at-death estimation derives from the overlap between the three following postcranial developmental phases: a Todd pubic symphysis score of P7, a Suchey-Brooks female pubic symphysis score of P4, and a Lovejoy et al. auricular surface score of P5 (Buikstra and Ubelaker, 1994). The overlapping chronological age for these three postcranial developmental phases is approximately 40 years of age.

Further morphologies of the osteological elements recovered from Grave 022 that comprise the lower vertebral column may complicate the age-at-death estimation for Human EA016. These morphologies are apparent starting with the penultimate thoracic vertebra (T11) and continue inferiorly through the vertebral column into the sacrum and on into the sacrum's articulation with the right ilium at the sacro-iliac joint (SI joint, or auricular surface). The potential impact of these morphological features in the osteological elements comprising the lower vertebral column is most relevant for the right ilium; bioarchaeological analysis of the auricular surface of the right ilium contributed to the overall age-at-death estimation for Human

EA016. As part of the sacro-iliac joint, the right auricular surface displays an anomalous morphology mirrored in the right auricular surface of the sacrum, which may be a function of or at least related to what appears to be the lumbarization of the first sacral body (S1) into a sixth final vertebra (L6/S1), the sacrum comprising four rather than the standard five sacral bodies, the left ala/promontory of the sacrum bearing a false joint/accessory articular facet for L6/S1, and the superior articular facets for L6/S1 manifesting anomalous and asymmetrical morphologies. Taken together, these paleopathological indicators throughout the lower vertebral column and sacrum may confound age-at-death estimation derived from the right ilium's auricular surface due to heightened biomechanical stressors on the sacro-iliac joint. These morphological changes to the pelvic girdle may impact wear and changes to the auricular surfaces, which would complicate age-at-death estimations from these joint surfaces using Lovejoy et al. (see Buikstra and Ubelaker, 1994). Thus, a more conservative estimate of Human EA16's age at death derived only from the pubic symphysis (correlating results from the use of Todd's vs. Suchey-Brooks' methods, respectively) would be between 35 and 40 years of age. The paleopathological indicators within the pelvic girdle and their implications will be discussed in more detail below in the *Paleopathological Indicators* subsection.

F.3.1.3 Paleopathological indicators

F.3.1.3.1 Cranium

No cranial elements were identified during bioarchaeological analyses of osteological materials recovered from Grave 022 at Elst Ar aside from a single complete mandible. The complete mandible contained three adult/permanent teeth – RP_3, RP_4, and RM_1 – in full occlusion with some wear. Moreover, some dental calculus has accumulated at the cemento-enamel junction (CEJ) of all three teeth in their lingual and buccal aspects. The remaining 13 empty crypts/alveoli bear no evidence of histological reaction or resorption, indicating that no adult teeth were lost antemortem. However, no loose teeth were identified in the bioarchaeological assemblage from Grave 022.

F.3.1.3.2 Vertebral column

Signs of degenerative joint disease (DJD) appear throughout the vertebral elements recovered from Grave 022. The osteological elements comprising the lower vertebral column, starting with the penultimate thoracic vertebra (T11) through into the sacrum, manifest anomalous morphologies that collectively result in an asymmetrical lower vertebral column (i.e., scoliosis canting to the left). Congenital factors, particularly the full lumbarization of the first sacral body (S1, with the resulting sacrum comprising only four rather than five sacral bodies), are most likely responsible for these morphologies, rather than trauma, infection, or DJD. Six complete lumbar vertebrae and a single sacrum comprised of four (rather than five) sacral bodies were identified during bioarchaeological analysis of Grave 022's osteological assemblage. As discussed in more detail below, this unusual morphology is congenital in origin.

F.3.1.3.2.1 Cervical vertebrae

The two cervical vertebrae display signs of DJD: some microporosity on the superior and inferior articular surfaces of the vertebral body/centrum and rimming around the edges/margins of those surfaces.

F.3.1.3.2.2 Thoracic vertebrae

Vertebral body/centrum compression in the anterior aspect appears in five of the 12 thoracic vertebrae recovered – the third, 9th, 10th, 11th, and 12th thoracic vertebrae (T3, T9-T12) – with very marked anterior compression of T11's and T12's vertebral body. All twelve thoracic vertebrae manifest the following signs of DJD: rimming of the edges/margins of vertebral body/centrum superior and inferior articular surfaces; microporosity on these vertebral body/centrum articular surfaces; and very small osteophytes (bony deposits on and around articular surfaces). The pores of microporosity increase to macroporosity and the number of osteophytes grows moving caudally/inferiorly down the thoracic vertebrae. In another indication of DJD, sharp margins have formed around the articular surface of the transverse processes' costal facets on some of the thoracic vertebrae. In particular, macroporosity marks the articular surface of T11 and T12's vertebral body's costal facets, with very large macroporosity appearing in T12.

Concavities or endplate lesions, sometimes progressed into Schmorl's nodes, mark the intervertebral articular surfaces of some thoracic and lumbar vertebral centra. A Schmorl's node appears on the superior intervertebral articular surface of T3 and T11. An endplate lesion appears on the inferior intervertebral articular surface of T8, T9, T10, and T11. The asymmetry or scoliosis of the lower vertebral column is first evident in T11, which has asymmetrical superior and inferior articular facets. This presentation continues in the inferior articular facets of T12, with the left one presenting lumbar-like morphology but the right one presenting thoracic-like morphology (i.e., the left inferior articular facet is curved as is standard in T12 for articulation with L1, whereas the right is flat like classic thoracic articular facets).

F.3.1.3.2.3 Lumbar vertebrae

As indicated above, six rather than five lumbar vertebrae belonging to one individual were recovered from Grave 022. The “sixth” lumbar vertebra results from the lumbarization of the first sacral body during development. Lumbarization and sacralization are etiologically congenital morphologies, with full lumbarization of the first sacral body (S1) being rarer than the sacralization of the fifth lumbar vertebra (L5: see Mann et al., 2016). This project refers to the six lumbar vertebrae and single sacrum as follows: L1; L2; L3; L4; L5; L6/S1 (final lumbar vertebra); and S2-S5 (sacrum comprised of four sacral bodies).

Microporosity appears on the superior and inferior articular facets on the transverse processes of all lumbar vertebrae, along with depression of the centrum/intervertebral body superior and inferior articular surfaces and rimming around those margins in some lumbar vertebrae. The vertebral body of the first lumbar vertebra (L1) is compressed in its anterior aspect. L1 displays anomalous facets: a demi-facet analogous to thoracic vertebral demi-facets for articulation with rib tubercles appears on the left and right transverse processes, and its superior articular facets are asymmetrical. The left superior articular facet presents typical lumbar morphology, whereas the right presents thoracic morphology (matches T12).

Postmortem damage is evident on the vertebral body of L2, and its superior and inferior articular facets display anomalous morphologies.

Paleopathological indicators become increasingly evident in the lower lumbar vertebrae. While L3 does not exhibit marked anomalous morphologies or paleopathological indicators, L4 has shallow yet antero-posteriorly enlarged superior and inferior articular facets, as does L5. Moreover, at L5 the vertebral column angles to the left. In the final lumbar vertebra (L6/S1), the superior and inferior articular facets are asymmetrical. While osteophytes/exostoses mark the margins of the left and right superior articular facets, L6/S1'sleft superior articular facet is noticeably curved. The inferior articular facets of L6/S1are even more asymmetrical than the superior. The left inferior articular facet is narrow and its inferior aspect manifests what appears to be a healed fracture[120] (perhaps a stress fracture associated with the compression and resultant spondylosis of the final lumbar vertebra: L6/S1). The right inferior articular facet is flat and wide antero-posteriorly.

The final lumbar vertebra is a fully lumbarization first sacral body (L6/S1) that articulates with the sacrum (at S2, rather than at the standard S1) at a "false joint". This triangular "false joint" is located on the inferior lateral aspect of L6/S1's left transverse process and its mirror is visible on the left ala/promonotory of the sacrum (S2).

F.3.1.3.3 Thorax

Paleopathological indicators of physical trauma and DJD appear throughout the osteological elements of the thorax.

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[120]This presentation may be the result of a stress or fatigue fracture (i.e., repetitive stress injury) associated with the degenerative pathologies (i.e., spondylosis) in L6/S1.

In the manubrium, microporosity and macroporosity mark the articular facets for the left and right first ribs, and for the sternum. All of the costal articular facets of the sternum display microporosity and macroporosity. Microporosity and macroporosity appear on most rib heads and some tubercles (sites of articulation with the vertebral column at thoracic vertebral bodies and transverse processes, respectively), with the degree of porosity increasing moving inferiorly toward the 12th ribs. Some inclusions appear on an indeterminate right rib head and tubercle in addition to microporosity and macroporosity.

Healed fractures, likely not fully stabilized during the healing process, are evident throughout the left and right ribs. In three left lower ribs, a single healed fracture appears ventral/anterior to the tubercle. In four right indeterminate ribs, a single healed fracture appears ventral/anterior to the neck.

F.3.1.3.4 Upper limbs

Two complete scapulae (left and right) and two complete clavicles (left and right) were identified during bioarchaeological analysis of Grave 022. Some postmortem damage occurred to both scapulae. Both scapulae present anomalous morphologies: the superior angle is shifted laterally, the superior margin is shortened, and an exostosis/bony projection projects medially from the medial border of the inferior angle. This bony projection may be the ossification of a ligament attaching the rhomboid(eus) major or latissimus dorsii muscle to the scapula. As seen in other scapulae from the Xiongnu cemetery at Elst Ar, the left scapula presents a notch in the superior border near the coracoid that appears to be in the process of forming into a suprascapular foramen through the ossification of the suprascapular transverse ligament (early scapular bridging: p. 534 in Mann et al., 2016).

Both the left and right clavicle display signs of DJD, including bilateral microporosity on the articular facet for the manubrium (i.e., at their sternal/medial aspects). The left clavicle displays some microporosity on the articular facet for the left acromion, along with a deep oval-shaped inclusion (or fossa?) into the trapezoid line. The trapezoid ligament attaches to the lateral aspect of the clavicle at the trapezoid line, itself a component of the coracoclavicular ligament that is the strongest stabilizer of the acromioclavicular (AC) joint (Standring, 2015). The superior aspect of the left clavicle is stained with some green coloration, perhaps as a result of prolonged contact with bronze or copper. In the right clavicle, both macroporosity and microporosity mark the articular facet for the acromion. Like in the left clavicle, a major inclusion marks the inferior aspect of the lateral/acromial end of the right clavicle at the trapezoid line. However, this inclusion is neither as deep nor as ovaloid as that in the left clavicle.

Three humerii were identified during bioarchaeological analysis of Grave 022: two right and one left. The partial right humerus is markedly longer and more robust than the complete right humerus, which is relatively short and gracile. The single left humerus is of a similar size and presentation to the longer and more robust partial right humerus. The muscle attachment sites on all three humerii are rugose. However, both the larger left and right humeri have inclusions (fossae) the muscle attachment sites at the crest of the lesser tubercle (anterior and superior aspect of the humeral shaft), and the inclusions are larger in the right than the left. The crest of the lesser tubercle is the site of insertion of the latissimus dorsi and teres major muscles on the humerus. Compare these fossae on the larger and longer left and right humeri to the bony projection on the medial aspect of the inferior border in the left and right scapulae. These sites on the humeri and the scapulae serve as insertion points for one of the same muscles: latissimus dorsi.

One left ulna and one right ulna were identified during bioarchaeological analysis of the mortuary assemblage from Grave 022 at Elst Ar. The marked size difference observed between the two right humeri (see above) appears in the ulnae, where the right ulna is longer and robust compared to the shorter and gracile left ulna. In the left ulna, microporosity and macroporosity appear on the lunate surfaces (for articulation with the distal humerus). The shaft and distal aspect of the left ulna is stained green, similar to the discoloration observed in the left clavicle discussed above. In the right ulna, osteophytes/exostoses mark the nonarticular surface between the superior and inferior lunate surfaces.

Three radii were identified during bioarchaeological analysis of the mortuary assemblage from Grave 022: two left and one right. As in the case of the ulnae and the humeri, a marked difference in size separates the longer and more robust right radius from the two shorter and more gracile left and right radii. In the more gracile left and right radii, small osteophytes/exostoses and sharpening of margins mark the distal articular surfaces. The more gracile left radius is stained green at its distal aspect very similarly to the discoloration observed in the left ulna and left clavicle.

For the bones of the hand discovered in Grave 022, two left capitates and two left 5th metacarpals (MC5) indicate that a minimum of two human individuals were interred therein. Signs of DJD and physical trauma appear in eight bones of the hand (out of 36 identified during bioarchaeological analysis of the mortuary assemblage from Grave 022). The distal articular surface (head) of two right metacarpals (RMC1 and RMC3) display eburnation, an indication of severe joint degeneration. Osteophytes also mark the distal articular surface of RMC1. One first/proximal phalange manifests a cut or near bifurcation of its distal aspect, perhaps the result of a healed fracture. Osteophytes are widespread on the articular surfaces of all five second/intermediate phalanges from Grave 022, and eburnation marks the distal articular surface of two of these second/intermediate phalanges.

F.3.1.3.5 Pelvic girdle

As discussed above in the *Vertebral column* subsection, the sacrum is made up of only four sacral bodies, rather than five, as a result of the full lumbarization of the first sacral body (L6/S1). The final lumbar vertebra (L6/S1) articulates with the sacrum (S2) at a "false joint" between the inferior lateral aspect of L6/S1's left transverse process and the left ala/promonotory of S2 in addition to the standard sites of articulation. The asymmetry of the lower spinal column that starts in the lower thoracic vertebrae continues to the sacrum. The superior articular facets on S2 for articulation with L6/S1 present anomalous morphologies: the left is foreshortened supero-inferiorly with a large osteophyte/exostosis at its inferior aspect; the right is flat and latero-medially elongated.

The first coccygeal body is also present and presents an asymmetrical morphology, canting to the left. The left site of articulation for the final sacral body angles toward the sacrum's dorsal wall, whereas the right does not noticeably angle.

The anomalous morphological presentation of the lower vertebral column and sacrum may have effected Human EA16's overall pelvic girdle, particularly the left ilium (and possibly ischium and pubis). Only elements comprising the right innominate were identified during bioarchaeological analysis of Grave 022. However, the right ilium manifests an anomalous morphology of the auricular surface, the bony portion of the right sacro-iliac joint, where it articulates with the right aspect of the sacrum. Major inclusions also mark the cortical bone forming the greater sciatic notch. One might hypothesize that the absent left ilium presents an even more markedly anomalous morphology in its auricular surface, as the “false joint” between the sacrum and the “final lumbar” (L6/S1, see above) occurs on the left aspect.

As discussed in the *Age-at-death estimation* section above, these anomalous morphologies of the pelvic girdle and lower vertebral column may have inculcated changes in the right ilium’s auricular surface, which was used to generate the estimated age at death for Human EA16. It is challenging to determine the extent to which altered or increased biomechanical stress on the SI joints (only the right SI joint is preserved completely in the osteological elements from Grave 022) effected the auricular surface of each ilium. However, it prompts a cautious estimation of age at death based on this joint surface, casting some doubt on the empirical certainty of Human EA16’s age-at-death estimation of between 35 and 40 years of age.

The morphological changes to the preserved pelvic girdle elements from Grave 022 belonging to Human EA16 are evident in the sacrum and right ilium. Obvious morphological anomalies in the right ischium and pubis were not observed. These impacts on the right ilium, seen in the auricular surface and the inclusions at the greater sciatic notch, may indicate changes to the pelvic girdle that also complicate skeletal sex assessment for Human EA16 discussed in the *Skeletal sex assessment* section above.

Postmortem damage to the right innominate from Grave 022 (Human EA16) prevented secure assessment of which of the two right femora (see below) articulated with it. If this had been possible, it would have yielded a line of empirical evidence by which to assign the most robust and rugose lower limb elements versus the more gracile lower limb elements to Human EA16 (and, by inference, the others to Human EA17). Unfortunately, sufficient conditions to conduct these inferences were lacking, and no solid empirical basis for assigning the duplicate lower (and upper) limb elements to Human EA16 versus Human EA17 exists at this point.

F.3.1.3.6 Lower limbs

"Duplicate" osteological elements from the bones comprising the leg were identified during bioarchaeological analysis of Grave 022: two right femora; two left and two right tibiae; and two left and two right fibulae. The marked difference in size and robusticity observed in the "duplicate" arm bones also appears in these "duplicate" leg bones. One right femur is huge in size. The other right femur and the left femur are smaller and more gracile. In this pair of smaller, gracile left and right femora, numerous osteophytes mark the lateral and anterior aspects of the distal femoral articular surface. No other paleopathological indicators were observed in the three femora, the four tibiae, or the four fibulae. One pair of left and right tibiae are huge, whereas the second pair of left and right tibiae are small and gracile. This pattern holds true for the four fibulae: one pair of left and right are huge, whereas the second pair are small and gracile.

For bones of the foot identified in this bioarchaeological assemblage, the presence of two left calcanei, two left and two right tali, two left and two right cuboids, two right naviculars, two left and two right 1st/medial cuneiforms, two left and two right 2nd/intermediate cuneiforms, two left and two right 3rd/lateral cuneiforms, two left and two right first metatarsals (MT1), two left and two right MT2, two left and two right MT3, two left and two right MT4, two right MT5, and seven pedal proximal phalanges indicate that a minimum of two human individuals were interred in Grave 022.

Marked size difference and signs of DJD demarcate these pedal elements into two sets of feet, one set comprised of larger bones that display no paleopathological indicators and the second set comprised of smaller bones marked with eburnation and osteophytes on some articular surface. To wit, the distal articular surface of the smaller LMT1 is marked with eburnation, a sign of extreme joint degeneration. Osteophytes appear on the articular surface of all "small" distal phalanges.

F.4 Nonhuman Animals in Grave 022

Just over 59% of the nonhuman animal osteological materials recovered from Grave 022 and stored in the ATRC collections facility in Ulaanbaatar were identifiable to genus or taxon, at 190 out of a total 320 nonhuman animal osteological elements. Grave 022 is one of two mortuary contexts at Elst Ar analyzed in this project that contained nonhuman animal individuals (or their component parts) from all five taxa of *tavan mal khoshuu* identified at Elst Ar: *Equus* sp.; *Bos* sp.; *Ovis aries*; and *Ovis/Capra*. Of the 190 nonhuman animal osteological elements identified to genus or taxon, *Equus* sp. elements comprise nearly 39% (*Equus* sp. n = 74), rendering equid remains the majority of the identifiable-to-taxon zooarchaeological assemblage from Grave 022. *Bos* sp. elements comprise another 31% (*Bos* sp. n = 59), followed closely by *Ovis/Capra* elements (just over 29%; *Ovis/Capra* n = 56). A single *Ovis aries* element was identified from Grave 022, making it just over 0.05% of the identifiable-to-taxon zooarchaeological assemblage (*Ovis aries* n = 1).

F.4.1 Species or taxon identification and MNI

A minimum of three *Equus* sp. individuals, three *Bos* sp. individuals, one *Ovis aries* individual, and four *Ovis/Capra* individuals (or their component parts) were identified during zooarchaeological analysis of the mortuary assemblage from Grave 022.

A minimum of three equids were interred in Grave 022 based on the count and state of osteological development (stage of epiphyseal fusion) of first and second phalanges (*Equus* sp. MNI = 3). The *Equus* sp. osteological elements recovered from Grave 022, like the skeletal remains of other equids from Xiongnu mortuary contexts at Elst Ar, potentially could belong to domesticated or wild equids (see Appendix C).

A minimum of three cattle were interred in Grave 022 based on the count and state of osteological development (stage of epiphyseal fusion) of first, second, and third phalanges (*Bos* sp. MNI = 3)[121]. While the cattle (*Bos* sp.) at Elst Ar were very likely domesticates, domesticated cow (*Bos taurus*), yak (*Bos grunniens*), and their various hybrids could have been present in this region of Central Mongolia[122].

The single *Ovis aries* element is an articulated cranium with left and right horncores, assigned to species using nonmetric traits and methodologies established to differentiate domesticated sheep (*Ovis aries*) from domesticated goats (*Capra hircus*: Boessneck et al., 1964) Although five *Ovis/Capra* first left ribs were identified in the zooarchaeological assemblage from Grave 022, one of these first left ribs may have belonged to the single *Ovis aries* individual

[121]The seven *Bos* sp. third/distal phalanges from Grave 022 came from three different individuals based on very evident size and robusticity differences.
[122]See Appendix C for more information about cows, yaks, and their various hybrids in Mongolia.

identified, as the *Ovis/Capra* taxon encompasses the *Ovis aries* taxon. Therefore, a minimum of one sheep was interred in Grave 022 (*Ovis aries* MNI = 1), while a minimum of four ovicaprids were interred therein (*Ovis/Capra* MNI = 4) based on the count of first left ribs.

It was possible to estimate Minimum Number of Individuals (MNI: Lyman, 1994) for more than one element of the taxa identified in Grave 022 (*Equus* sp.; *Bos* sp.; *Ovis aries*; and *Ovis/Capra*), then to cross-reference those estimates to generate a more refined MNI assessment. While this approach has the potential to factor age-at-death estimates and skeletal sex assessments into MNI calculation, MNI in general is prone to overestimating nonhuman animal MNI (see Lyman, 1994). Skeletal sex assessment of nonhuman animal osteological materials from Grave 022 was not possible. However, age-at-death estimates based on state of epiphyseal closure/fusion were possible for some *Equus* sp., *Bos* sp., and *Ovis/Capra* elements.

F.4.2 Age-at-death estimation

Five of the 11 nonhuman animals (total MNI = 11) interred in Grave 022 at Elst Ar were osteological subadults, in that their skeletal systems were still in the process of developing and fusing at the times of their deaths.

Two of the minimum of three *Equus* sp. individuals identified in the zooarchaeological assemblage from Grave 022 were subadults. Numerous equid postcranial elements were still osteologically developing when the individual(s) in question died. Using the established age ranges for the fusion of these unfused or fusing elements (Silver, 1969; Sisson et al., 1975; Bennett, 2008), the following *Equus* sp. individuals and their ages at death were estimated: one foal who died at a very young age[123]; one osteological subadult who died near to but before 3-3.5 years of age[124]; and one adult of indeterminate age. The very young foal was likely no more than two months of age when it died, and very likely died much closer to its birth. The second subadult equid was a colt or filly – or older *daaga*/*sarvaa* or younger *shüdlen*[125] – when it died.

Out of the minimum of three *Bos* sp. individuals interred in Grave 022, one was an osteological subadult when it died. This individual died within a fairly narrow calendrical range – 14-17 months – thanks to the presence of a line of fusion for the proximal epiphysis of a second phalange[126]. Overall, this *Bos* sp. individual was in its second full year of life when it died: a yearling cow, or *byaruu*[127].

Two of the *Ovis/Capra* individuals from the minimum of four interred in Grave 022 were osteological subadults when they died. One *Ovis/Capra* individual is a very young individual who died before 6 months of age based on unfused and developing cranial elements that include an extremely small hornbud. A second *Ovis/Capra* individual died as an osteological subadult, based on the unfused head epiphysis in a left and right rib. Unlike the long bones for sheep and goats, a developmental sequence for ribs is not well established or widely used in zooarchaeological literature to generate age-at-death data for mortality profiles (Zeder, 2006). Like in the vertebral column, the age range for costal epiphyseal fusion is too wide and variable to be of use in estimating this individual's age-at-death in months or years (Silver, 1969). Thus,

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[123]Based on a single equid third/distal phalange that is tiny in size and displays epiphysis surface at its (proximal) articular area. In horses, the third phalange is either completely (Table 15-2 on p. 272 of Sisson et al., 1975) or nearly completely (Silver, 1976; Bennett, 2008) ossified at birth.

[124]Based on the line of fusion visible at the proximal epiphysis of the left and right tibiae. This epiphysis fuses between three and three and a half years of age in horses (Silver, 1969; Sisson et al., 1975; Bennett, 2008).

[125]Colt and filly are sex-specific age classes for horses in English: a male and female horse between two and four years of age. In Mongolian, *daaga* or *sarvaa* (даага; сарваа: two years of age) and *shüdlen* (шүдлэн: three years of age) are sex-neutral age classes for horses (Fijn, 2011; Erdenetsogt, 2014). See Appendix C.

[126]The proximal epiphysis in second phalanges fuses between 15 and 18 months in cattle (Grigson, 1982).

[127]In English pastoral terminology, cattle in their second full year of life (12-24 months of age) are yearlings or stirks. These animals are *byaruu* (бяруу) in Mongolian (Fijn, 2011; Erdenetsogt, 2014). See Appendix C.

a young lamb or kid under 6 months of age – a *khurga* or *ishig*[128], respectively – and an osteological subadult of indeterminate calendrical age were interred in Grave 022.

F.4.3 Paleopathological indicators

No paleopathological indicators were observed on any of the nonhuman animal osteological elements recovered from Grave 022. However, 16 elements and fragments displayed evidence of intentional modification. Two elements show small cutmarks on their surfaces; the other 14 are examples of nonhuman animal bone worked into objects.

F.4.4 Seasonality profile

The age-at-death estimations for osteologically subadult *tavan khoshuu mal* elements discussed above were used to generate a seasonality profile for Grave 022. These include the very young *Ovis/Capra* individual (lamb or kid) died between birth and 6 months of age; the *Bos* sp. individual (yearling cow) died between 14 and 17 months of age; and the very young foal that died between birth and two months of age. Following Sambuu's (1945/2000) *tavan khoshuu mal* breeding and birthing schedule[129], the Xiongnu community at Elst Ar engaged in the mortuary practices that generated Grave 022 between the beginning of May and the end of July. Similarly, when the age-at-death estimate for the lamb or kid is correlated to Erdenetsogt's (2014) *tavan*

[128] A lamb is a sheep under one year of age; a kid is a goat under one year of age. *Khurga* (хурга) and *ishig* (ишиг) are the Mongolian terms for these sheep/goat age classes (Erdenetsogt, 2014). See Appendix C.
[129] See Appendix C.

khoshuu mal breeding and birthing schedule, the seasonality profile for Grave 022 expands slightly to late April through the end of July.

F.4.5 Cutmarks

Small cutmarks appear on only two nonhuman animal osteological elements from the zooarchaeological assemblage recovered from Grave 022 at Elst Ar. The single *Ovis/Capra* C2 (subadult) bears cutmarks on its caudal inferior facets. The single *Bos* sp. left first rib (subadult) bears a cutmark on its sternal end.

F.4.6 Worked nonhuman animal bone

Fourteen fragments of worked nonhuman animal bone were identified in the zooarchaeological assemblage from Grave 022 at Elst Ar. Thirteen of these fragments appear very similar to the bone supports identified in other Xiongnu mortuary contexts as bow parts (specifically, supports for the bow: see Chapter 3). The remaining item of worked nonhuman animal bone is a bovid astragalus perforated and with its shaft edges worn/worked down.

F.4.7 Discoloration

One nonhuman animal bone fragment in the zooarchaeological assemblage from Grave 022 is discolored. An indeterminate fragment of cortical bone is stained blue, which is consistent with contact with copper.

APPENDIX G

GRAVE 012

G.1 Overview of Grave 012

Grave 012 contained a minimum of five individuals: two humans (MNI = 2) and three cattle (MNI = 3). The three cattle are one fetal/infantile calf who died between the end of gestation and the first three weeks of life (fetal or infantile: last stage of pregnancy or within first few days after birth), one yearling or stirk[130] who died between 12 and 18 months of age, and one adult who died between 2 and 5 years of age. Therefore, at least five individuals (or some of their body parts) were intentionally assembled together during mortuary ritual and the creation of mortuary space (Grave 012) by members of the Xiongnu community at Elst Ar.

Contextual information does not allow reconstruction of individual nonhuman animal bodies; moreover, that more than one human was originally interred in Grave 012 cannot be ruled out. The 2012 Mongolian field report on excavations at Elst Ar indicates that Grave 012 was "looted and robbed"; following Brosseder (2009), this analysis characterizes Grave 012 has bearing evidence of having been re-opened after the mortuary rituals that initially assembled Humans EA01 and the fifteen nonhuman domesticated animals in the tomb. It is possible that components of the mortuary assemblage in Grave 012, including portions of the multispecies assemblage, were placed there during subsequent intrusions into or re-openings of the grave.

[130] In English pastoral terminology, cattle in their second full year of life (i.e., between 12 and 24 months of age) are termed "yearling" or "stirk". The Mongolian term for the same animal is *byaruu* (бяруу). See Appendix C for more detail. The yearling in Grave 012 died between 12 and 18 months of age.

G.2 Contextual Information on Grave 012 from The Mongolian Field Report

According to the 2012 field report on the 2011 excavations at Elst Ar, Grave 012 has a circular stone surface feature with a diameter of 7 meters located in the southern section of the Xiongnu cemetery. Excavators encountered a human sacrum, right femur, right radius, and right ulna at 50 cm about 260 cm from the center section of the grave's southern margin. The *tolbo*[131] first appeared at 1 m in Grave 012's center; the stone enclosure/cist around the coffin at 140 cm. At the south end of the capstone were two cow skulls and lower legs (presumably metapodials, but possibly including phalanges); at the north end, an unspecified amount or kind of seeds were recovered. At 220 cm, excavators identified a fragment of worked bone (rib with rectangular perforation) at the western wall of the stone cist. This rib fragment, along with most worked bone specimens recovered from the 2011 and 2012 excavations at Elst Ar, was not made available during the 2014-2016 analyses in Ulaanbaatar that form the bulk of this project. The 2012 report notes that the rib is *bod mal*[132] (horse, cattle, or camel), and from the report photograph it appears to be a midshaft fragment. The rib fragment is 4.5 cm wide and 14 cm long; the rectangular perforation is 1.2 cm x 1 cm. Archaeologists have not yet identified the nature of this artifact. At 230 cm, an iron belt buckle (?) was recovered at the same depth as a human left femur, left tibia, left fibula, left ulna, left radius, and foot bones (presumable left foot bones) in anatomical position. Bones of a large rodent were found in the northwestern corner of the stone cist; these skeletal elements were not present in the osteological materials from Grave 012 stored in the Ancient Technologies Research Center, SHUTIS/MUST, Ulaanbaatar.

[131]In this context, *tolbo* (толбо) refers to the area of soil color indicating disturbance of the grave structure (i.e., "looter's cut").

[132]See Appendix C for a discussion of *bod mal* and other animal husbandry vocabulary.

Excavations also yielded an iron-bronze item ("төмөр, хүрэл эдлэл") 15 cm by 4.3 cm in pieces and a blue bead (that in the report photo appears to be turquoise) with a 0.5 cm diameter (see Erdenebold et al., n.d.a).

The human skeletal remains labeled as recovered from Grave 012 in the collections storage facilities at ATRC, MUST, in Ulaanbaatar were subdivided and labeled "upper" (*deerees*/дээрээс) and "lower" (*dooshoos*/доошоос). The 2012 field report clearly mentions a major depth difference between some human remains found in the gravefill (at 50 cm) and those in the coffin/cist (at 230 cm): a human sacrum, right femur, right radius, and right ulna at 50 cm; at 230 cm, a human left femur, left tibia, left fibula, left ulna, left radius, and foot bones (presumable bones of the left foot) were discovered in anatomical position.

G.3 Humans in Grave 012

G.3.1 Overview of Humans EA06 and EA07

A minimum of two human individuals (or some of their parts) were interred in Grave 012: Human EA06 and Human EA07. A total of 163 human osteological materials were recovered from Grave 012 at Elst Ar and identified during laboratory analyses, including a single articulated cranium with no mandible (*Homo sapiens* n = 163)[133]. The 2011 archaeological team that excavated Grave 012 separated the human osteological materials recovered from that context into two categories based on their location/depth/locus: *deerees* ("above") and *dooshoos* ("below"). This separation of human osteological materials into "above" and "below" likely

[133]The articulated cranium is counted as a single osteological element, while all of the teeth (loose and in their alveoli) are counted as separate osteological elements.

refers to the two distinct loci where human skeletal remains were discovered as recorded 2011 field report: 50 cm into the grave cut (where a human sacrum, right femur, right radius, and right ulna were discovered) as "above" and 230 cm into the grave cut (where a human left femur, left tibia, left fibula, left ulna, left radius, and foot bones were discovered in anatomical position) as "below". However, as numerous additional human osteological elements were recovered from Grave 012 and identified during laboratory analysis (this project) in addition to those listed in the field report, and that these human osteological elements comprised a minimum of two *Homo sapiens* individuals, treating the "above" and "below" as two separate individuals (rather than the comingled remains of two individuals) would be ill-advised. Rather, the distribution of human skeletal materials in Grave 012 supports the assessment that this mortuary context was disturbed or re-opened after the initial assembling of humans and other animals through mortuary ritual in the tomb. Such re-opening of Grave 012 may have included the deposition – intentional and otherwise – of new materials into the context, as well as removal of components of the mortuary assemblage.

G.3.1.1 Minimum number of individuals (MNI)

Bioarchaeological inventory of the osteological materials from Grave 012 identified osteological elements from a minimum of two human individuals (i.e., *Homo sapiens* MNI = 2). An MNI of two derived from the presence of the following human osteological elements: eight cervical (C3-C7) vertebra; eight lumbar vertebra; two right first ribs; two left distal tibiae; two right radii; two left 3rd metacarpals (MC3s); and two left 5th metacarpals (MC5s). Although at least two humans were part of the Grave 012 mortuary assemblage (relational osteobiography), identifying which osteological elements comprised Human EA06 vs. Human EA07 presents a significant challenge. As a result, the analyses below present skeletal sex assessments, age-at-death estimates, and paleopathological indicators for all human osteological elements recovered from Grave 012 without generating osteobiographical accounts that rely on the construction of human individuals from human skeletal remains.

G.3.1.2 Skeletal sex assessment

Two human osteological elements from Grave 012 could be assessed for nonmetric skeletal sex traits: a complete articulated cranium (lacking the mandible) and a nearly-complete os coxae (95% of both the left and right fully-articulated pubis, ilium, and ischium). Analysis of the nonmetric skeletal traits from the pelvic girdle suggest that it was skeletally male (very likely male: see Klales et al., 2012) based on all five sex-linked skeletal traits in the pelvic girdle. Analysis of nonmetric skeletal traits from the cranium suggest that it was skeletally female (probably female: see Buikstra and Ubelaker, 1994). Without an associated mandible, skeletal sex assessment of the articulated cranium from Grave 012 derives from the scoring of four (rather than six) traits. This "mismatch" between pelvic girdle and cranium could be the result of the pelvic girdle belonging to Human EA06 and the cranium belonging to Human EA07; however, both osteological elements could belong to the same individual. In the second case, cranial morphological variation with this archaeological population (the Xiongnu of Central Mongolia) may differ from the sample population from which standard bioarchaeological methods of skeletal sex assessment using nonmetric traits of the cranium (see Buikstra and Ubelaker, 1994) were developed (i.e., populations from 20th-century United States contexts). In a similar vein, this may be an example of an individual who does not conform to the vision of skeletal sex on which bioarchaeological analysis relies (see Appendix D).

G.3.1.3 Age-at-death estimation

Age-at-death estimation based on the pubic symphysis yields an age at death of over 50 years (Todd: 50+ years; Suchey-Brooks: 35+ years; see Ubelaker and Buikstra, 1994), whereas estimation based on the auricular surface yields at age at death of 45-50 years (Lovejoy et al.; see Buikstra and Ubelaker, 1994). Reconciling these different age-at-death estimates yields the range from 45 to 50 years at death for the human pelvic girdle/os coxae from Grave 012. Scoring the degree of cranial suture closure in the vault and latero-anterior regions for the articulated cranium from Grave 012 followed the methods outlined in Buikstra and Ubelaker (1994). However, the vault and latero-anterior regions returned inconsistent age-at-death estimates: approx. 27-44 years at death, and approx. 49+ years at death, respectively. Degree of cranial suture closure and obliteration as an indicator of age at death is less widely used in bioarchaeological and forensic anthropological research for a number of reasons (see Appendix D). Although the two cranial suture-based age-at-death estimates cannot truly be reconciled, they are broadly consistent with an individual who died in the 45 to 50 age range (i.e., the age-at-death estimate based on the human pelvic girdle from Grave 012).

G.3.1.4 Paleopathological indicators

Only human osteological elements from Grave 012 that display paleopathological indicators are listed below, rather than a complete inventory of human remains. Paleopathological indicators include: trauma; degenerative joint disease (DJD); histological reaction (i.e., evidence ofinfection in bony tissue); nonmetric traits; and anomalous morphological presentation due to genetic or congenital factors.

G.3.1.4.1 Cranium

The articulated cranium evinces healed trauma to the face in the form of a healed fracture in the left nasal bone. Multiple sites of histological reaction appear across this cranium in the face (at glabella; the left nasal, possibly introduced by the previously-noted trauma), mouth (in the hard palate at the intermaxillary suture), area of the ears (the left and right EAM: external auditory meatus), and basilar (occipital synchondrosis; pterygoid processes of the sphenoid).

All ten of the human teeth stored with the materials excavated from Grave 012 were loose at the start of laboratory analyses. Although no human mandible was present, several of the loose teeth were from the lower jaw: LM_3 and two premolars. The presence of mandibular teeth in the Grave 012 mortuary assemblage strongly indicates that at least one human mandible was present in the context prior to excavation. One canine (not clearly upper vs. lower), three upper premolars, and three upper molars comprise the remaining dental assemblage. Significant plaque accumulated and hardened into calculus on one of the upper premolars, covering more than a quarter of the tooth's crown. Previous research has yielded direct evidence of the consumption of dairy products in northern Mongolia during the Late Bronze Age, and possibly more than a millennium before the Xiongnu cemetery at Elst Ar was constructed (Jeong et al., 2018). Proteomic analyses of dental calculus from nine individuals (directly dated to 1380-975 BCE: Jeong et al., 2018) excavated from one county(*sum*) in Khövsgöl Province (*aimag*) identified two milk-linked proteins and a particular peptide specific to cattle, sheep, and goats (as opposed to other mammals, like camels, horses, reindeer, and humans). Future research on this tooth and other dental remains exhibiting calculus recovered from Elst Ar could use similar methods and potentially yield direct evidence for dairy consumption during the Xiongnu Empire.

Some of the loose teeth from Grave 012 may have fallen out of the articulated cranium postdepositionally (i.e., sometime after burial), as the following maxillary alveoli are fully open: left upper canine (LC/); left upper first and second premolars (LP^{3-4}); left upper central incisor (LI^1); and right upper central incisor (RI^1). The remaining alveoli for the other maxillary teeth are in the process of closing over (a few have closed completely), indicating that these upper permanent teeth were lost antemortem with enough time before death for the maxillary bone to remodel: upper left and right third, second, and first molars (LM^{1-3}, RM^{1-3}); upper right first and second premolars (RP^{3-4}); upper right canine (RC/); upper left and right lateral incisors (LI^2, RI^2).

G.3.1.4.2 Vertebral column

One lower thoracic vertebra presents what presents as an unfused spinous process and neural arch, which is very likely a midline unilateral spondylolysis (see Mann et al., 2016: 576-577, 581). Spondylolysis, when the neural arch of a vertebra fails to properly ossify, is often classed as “a repetitive stress fracture leading to joint instability” that is seen in high frequencies among some kinds of athletes: divers, wrestlers, and weightlifters (Mann et al., 2016: 576). The presence of unilateral spondylolysis in a human vertebra from Grave 012 suggests that at least one of the individuals interred therein engaged in heavy biomechanical load-bearing and work during their lifetime.

Signs of DJD manifest in many of the lower thoracic and lumbar vertebrae found in Grave 012, with bony deposits formed on the margins of the centrum articular surfaces (superior and inferior), and microporosity and macroporosity marking the surfaces themselves.

G.3.1.4.3 Thorax

Three human first ribs (one left, two right) were recovered from Grave 012. Two of these first ribs (one left, one right) display an extra bony growth at each rib's sternal end, where it articulates with the manubrium (superior portion of the breastbone); these are likely calcifications of costal cartilage (Mann et al., 2016). A healed fracture occurs in the shaft of one indeterminate lower rib. The left and the right clavicle each have a large, irregular inclusion at the muscle attachment site on the inferior aspect of the medial end where the clavicle articulate with the manubrium. These are rhomboid fossae, where the costoclavicular ligament inserts on the clavicle, and within the standard range of human variation (Mann et al., 2016). The costoclavicular ligament "strengthens the sternoclavicular joint" (White et al., 2012: 161), where the collarbone articulates with the manubrium. The lateral end of both clavicles (i.e., where each clavicle articulates with the acromion process of the scapula) manifest histological reaction at the muscle attachment sites on each one's inferior aspect. The oblique ridge (or trapezoid line) and the conoid tubercle serve as attachment sites for the trapezoid and conoid ligaments, respectively; these ligaments reinforce the articulation between the lateral/acromial process of the clavicle and the scapula, or the anterior aspect of the shoulder girdle (White et al., 2012). Note that the muscle attachment site paleopathologies of the two clavicles occur only on the inferior aspect (both lateral and medial ends), rather than on the superior aspect or either the posterior or anterior borders (i.e., where most of the major muscles attaching to the clavicle and their ligaments insert, such as the trapezius, deltoid, pectoralis major).

G.3.1.4.4 Upper limbs

The distal aspect of the right humerus manifests some extraneous bony deposits or exostoses superior to the trochlea (i.e., articular surface for the ulna) that weathered some postdepositional damage.

G.3.1.4.5 Pelvic girdle

In the os coxae, histological reaction marks the non-articular surface of each acetabulum. In the right acetabulum alone, exostoses appear along the rim forming around the margin of the lunate articular surface (for the head of the right femur).

G.3.1.4.6 Lower limbs

In the single complete right femur, the histological reaction observed in the right acetabulum is mirrored by major histological reaction at the fovea capitis, where the foveal ligament inserts.

The head of this right femur displays major DJD at its inferior aspect in the form of extreme lipping around the articular margin. The linea aspera of this same right femur is pronounced and robust, suggesting heavy biomechanical workload undertaken by some or all of the muscles attaching there (including the vastus medialis, adductor longis, adductor magnus, and biceps femoris). Infection in a right hip compounded by joint wear.

Three human tibiae were recovered from Grave 012: two lefts (one of which is partial, or about 90% complete) and one right. The partial left tibia is fused to a proximal fibula (damaged postmortem) where the two elements articulate. DJD in the form of major bony deposits appear on the proximal aspect of this left tibia and proximal fibula. The entire lateral aspect of this partial left tibia's shaft is marked with histological reaction.

G.4 Nonhuman Animals in Grave 012

G.4.1 Overview

Just under 40% of the nonhuman osteological materials recovered from Grave 012 at Elst Ar and subsequently stored in the ATRC collections facility in Ulaanbaatar were identifiable to species or genus. *Bos* sp. elements comprised the entirety of these materials, with no other species or genus identified in the assemblage (n = 80). Grave 012 is only one of three excavated Xiongnu mortuary contexts where only one nonhuman animal taxon comprised the zooarchaeological assemblage, Graves 004 and 021 being the other two. However, where Graves 004 and 021 contain only one nonhuman animal a piece (MNI = 1 for each context: small ungulate and *Ovis/Capra*, respectively), Grave 012 yielded a minimum of three nonhuman animal individuals (*Bos* sp. MNI = 3). Grave 012 is therefore the only excavated Xiongnu mortuary context at Elst Ar in which cattle alone comprised the nonhuman animal component of the multispecies assemblage.

The small number of elements from Grave 012 identified as *Bos* sp. made it possible to estimate Minimum Number of Individuals (MNI: Lyman, 1994) for more than one element, then to cross-reference those estimates to generate a more refined MNI assessment. While this approach has the potential to factor age-at-death estimates and skeletal sex assessments into MNI calculation, MNI in general is prone to overestimating nonhuman animal MNI (see Lyman, 1994). Skeletal sex assessment of nonhuman animal osteological materials from Grave 012 was not possible. However, age-at-death estimates based on state of epiphyseal closure and dental eruption were possible for numerous *Bos* sp. elements. Numerous *Bos* sp. and Large bovid (body-size class) cranial, postcranial, and dental elements showed incomplete epiphyseal fusion.

G.4.2 Age-at-death estimation

Nonmetric aging methods yielded a minimum of three different *Bos* sp. individuals (or their component parts) who comprised the zooarchaeological assemblage from Grave 012: one fetal/infantile calf who died between the end of gestation and the first few days of life; one who died between 12 and 18 months of age; and one adult of indeterminate age.

The fetal or infantile calf's age-at-death estimate derives from the state of eruption of deciduous cheekteeth (dP2-4) in four *Bos* sp. jaw fragments: left and right maxilla, and left and right mandible. In all four of these elements, the deciduous teeth are either unerupted (dP2 in all cases) or still erupting (dP3 and dP4 in all cases). The ages at which domesticated cattle deciduous teeth erupt varies (see Grigson, 1982, for a comparison of domesticated cattle dental eruption sequences). The most conservative age range for an individual with erupting deciduous cheekteeth would be an age at death between the late fetal stage (prior to birth) and 3 weeks after birth (see Appendix 2 in Grigson, 1982). However, early-maturing modern cows displaying this state of dental eruption would be between the late fetal stage and a few days after birth (USDA FSIS, n.d). An age at death prior to birth or at just a few days old finds further support in the majority of the dental eruption aging information from previous zooarchaeological and veterinary research compiled by Grigson (1982). The Grave 012 zooarchaeological assemblage further included fetal, infantile, or very young subadult postcranial and cranial osteological elements identified as *Bos* sp. or Large bovid (body-size class). These osteological elements would be consistent with the estimated age-at-death for the fetal/infantile calf identified through dental eruption, and likely derived from the same individual.

The age-at-death estimate for the second *Bos* sp. individual from Grave 012 derives from a combination of dental eruption (a left *Bos* sp. mandible portion where LM_2 was in slight wear but LM_3 was in the crypt: Grigson, 1982) and postcranial epiphyseal fusion data. Grigson's (1982) compiled dental eruption data correlated with age-at-death in *Bos taurus* present a wide chronological window for the eruption of both the second and third molars (maxillary and mandibular combined, see Grigson's Appendices 2 and 4). The most conservative age-at-death estimate based on dental eruption state alone would be between 1 and 5 years (Grigson, 1982: Appendix 2); the most refined would be 18 to 24 months at death (Grigson, 1982: Appendix 4).

The unfused proximal and shaft + distal portions of proximal/first phalanges (MNI = 1; *Bos* sp. proximal/first phalange fuses at 18-24 months: Grigson, 1982), and the unfused proximal and shaft + distal portions of intermediate/second phalanges (MNI = 1; *Bos* sp.

intermediate/second phalange fuses at 15-18 months: Grigson, 1982). Reconciling the dental and postcranial aging data yields at *Bos* sp. individual who died between 12 and 18 months of age.

The third and final *Bos* sp. individual from Grave 012 appears to be an individual who died over 2 years of age based on a portion of a left maxilla. Using Grigson's (1982) compilation of age-at-death data correlated to state of dental eruption, this individual either died between 2 and 5 years of age (Appendix 2 in Grigson, 1982), or between 30 and 31 months of age (Appendix 4 in Grigson, 1982).

G.4.3 Paleopathological indicators

Seven *Bos* sp. osteological elements identified in the Grave 012 zooarchaeological assemblage displayed paleopathological indicators: four proximal/first phalanges; one intermediate/second phalange; and three distal/third phalanges. Previous zooarchaeological research has investigated the presence of certain pathologies on the phalanges (and other lower limb bones) of domesticated cattle (primarily *Bos taurus*) believed to indicate osteological remodeling and response to biomechanical stress that may indicate traction (Bartosiewicz, 2008; Telldahl, 2012; Gaastra et al., 2018). In zooarchaeological literature, traction refers to nonhuman animals pulling loads, including activities like ploughing, and pulling carts and wagons (Gaastra et al., 2018). Paleopathologies observed in the *Bos* sp. phalanges from Grave 012 at Elst Ar that could be consistent with traction include: depression in distal articular surface (first phalange); stress fracture in the shaft (healing on the plantar surface of a first phalange; seen in all second phalanges with paleopathological indicators); exostoses (bony deposits: first phalange); and eburnation of joint surface (DJD in first phalange). While these observations are suggestive, in themselves they are far from sufficient for asserting that the biomechanical stress associated with heavy load pulling caused these pathologies. The question of traction for the *Bos* sp. specimens from Grave 012 at Elst Ar requires further paleopathological analysis using targeted methodologies (see Telldahl, 2012, for description of some approaches). Based on the element count and distribution by state of osteological development, the four proximal/first phalanges and one intermediate/second phalanges manifesting paleopathological indicators potentially indicative of traction belong to the one adult *Bos* sp. individual. It is possible that the three distal/third phalanges with possible traction paleopathological indicators derive from this same individual, but the age at which the distal/third phalangeal ossifies in *Bos* necessitates caution about such an interpretation.

G.4.4 Seasonality profile

The age-at-death estimations for certain osteologically subadult *tavan khoshuu mal* elements discussed above were used to generate a seasonality profile for Grave 012. The fetal/neonate *Bos* sp. individual (calf) died between birth and 3 weeks of age, and the yearling cow died between 12 and 18 months of age. The age-at-death estimate for the very young calf yields a narrow temporal window within which this individual died, which provides a key datapoint in seasonality profile generation. Following Sambuu's (1945/2000) *tavan khoshuu mal* breeding and birthing schedule[134], the Xiongnu community at Elst Ar engaged in the mortuary practices that generated Grave 012 between early March and mid-May. Similarly, when the age-at-death estimates for the calf and the yearling cow are correlated to Erdenetsogt's (2014) *tavan*

[134]See Appendix C.

khoshuu mal breeding and birthing schedule, the seasonality profile for Grave 001 shifts to late February through early June. This is partly because Erdenetsogt (2014) uses a wider temporal span for cattle birthing (late February through the beginning of May) in Mongolia compared to Sambuu (1945/2000).

G.4.5 Worked nonhuman animal bone

The fragment of worked nonhuman animal bone photographed and mentioned in the 2011 field report (Erdenebold et al., n.d.a) was not available during laboratory analysis and was not stored with the zooarchaeological/osteological assemblage recovered from Grave 012 in the ATRC/SHUTIS archaeological collections storage facility. According to the report, excavators discovered a *bod mal* (i.e., horse, cattle, or Bactrian camel: see Appendix C) midshaft rib fragment with a rectangular hole cut into it at 220 cm into the grave shaft (see Erdenebold et al., n.d.a). The rib fragment measured 4.5 cm by 14 cm, with the rectangular hole measuring 1 cm by 1.2 cm.

The zooarchaeological assemblage excavated from Grave 012 and available for analysis during this project yielded a second fragment of worked nonhuman animal bone. A shaft fragment from an unidentified taxon (large- or medium-sized animal class) was smooth and angled into a semi-point at one end.

APPENDIX H

OVERVIEW OF GRAVE 020

H.1 Introduction

Grave 020 contained a minimum of seven individuals: one human who died at 60+ years of age and was skeletally female and one human of unknown age at death or skeletal sex (*Homo sapiens* MNI = 2); one horse (*Equus* sp. = 1); one subadult cow (*Bos* sp. MNI = 1); one lamb/kid that died between birth and six months of age, and two adult sheep/goat (*Ovis/Capra* MNI = 3). The two *Homo sapiens* individuals are Human EA012 and Human EA013. Human EA012 was a skeletally female individual who died at the age of 60 or older. Nothing can be determined regarding Human EA013's skeletal sex or age at death, based on what *Homo sapiens* osteological elements were recovered from Grave 020 and the disturbed status of those remains. Thus, seven individuals (or their component parts) were interred in Grave 020 at Elst Ar.

H.2 Contextual Information on Grave 020 from The Mongolian Field Report

According to the 2013 field report on the 2012 excavations at Elst Ar, Grave 020 has a circular stone surface feature with a diameter of 8 meters located in the western section of the Xiongnu cemetery. Grave 020's *tolbo* (толбо: "gravecut") appeared at 1.7 m down; at 2.7 m, the stone cist, wooden coffin, *bod mal* scapula, ribs, and other unspecified elements appeared. Excavators uncovered human skeletal remains, which were not in anatomical position, starting at 3.17 m. They encountered the wooden floor of the coffin at 3.2 m, marking the end of the grave's cultural layers. The field report specifically notes that Grave 020 was looted and that the context's original organization has been lost (but see Chapter 3 for discussion of evidence for the reopening of Xiongnu mortuary contexts: Brosseder, 2009).

H.3 Humans in Grave 020

H.3.1 Overview of Human EA012 and Human EA013

106 human skeletal remains were identified from the osteological materials recovered from Grave 020 at Elst Ar (*Homo sapiens* n = 106)[135]. The co-mingled nature of these materials as encountered during the initial excavation (Erdenebold et al., n.d.b) make reconstruction of human individuals from osteological materials and estimation of skeleton completeness highly challenging.

Osteological elements from a minimum of two humans were interred in Grave 020 at Elst Ar: Human EA012 and Human EA013 (*Homo sapiens* MNI = 2). The human MNI derives from the presence of portions of two right scapulae. It is thus challenging to assign specific elements, aside from the right scapulae, to one human individual versus the second interred in Grave 020. This challenge is compounded by the disorganized distribution of human osteological elements as encountered during excavation. No human cranium or cranial elements were recovered from Grave 020, aside from an articulated mandible (left and right hemispheres). The mandible holds twelve permanent teeth, with the left and right second and third molars lost antemortem. These four teeth were lost long enough before death that the mandibular corpi bilaterally reduced and

[135]Complete, partial, and fragmentary human osteological elements were counted together, along with all teeth found loose or still in their alveoli.

remodeled. One loose permanent upper tooth (likely an adult maxillary premolar) with heavy occlusal wear was identified in the bioarchaeological assemblage from Grave 020. Much of a left and a right human os coxae were recovered, permitting skeletal sex assessment and age-at-death estimation using nonmetric methods (Buikstra and Ubelaker, 1994; Klales et al., 2012) deployed in this project. Thus, one human individual could be assessed for skeletal sex and age-at-death estimation: Human EA012. Nothing definite may be asserted about the skeletal sex or age at death of Human EA013.

H.3.2 Skeletal sex assessment

Nonmetric traits in the pelvic girdle indicate Human EA012 a skeletally female individual ("highly probable" based on combined methods from Buikstra and Ubelaker, 1994; Klales et al., 2012): features of the pubis, the greater sciatic notch, and presence of a preauricular sulcus. No cranial elements aside from an articulated mandible was identified in the bioarchaeological assemblage from Grave 020. The mandible underwent remodeling due to the antemortem loss of the lower second and third molars ($LM_{2,3}$ and $RM_{2,3}$). As a result, the mandibular nonmetric traits used to assess skeletal sex were likely impacted by these osteogenic processes and not suitable for analysis. Moreover, it is unclear whether the mandible belonged to the individual with the pelvic girdle still present (i.e., Human EA012) or the other human individual (Human EA013).

H.3.3 Age-at-death estimation

Nonmetric traits in the pelvic girdle analyzed using established methods for age-at-death estimation (see Buikstra and Ubelaker, 1994) indicate that Human EA012 died over 60 years of age. The left and right pubic symphyses were scored using the Todd and Suchey-Brooks methods (Buikstra and Ubelaker, 1994), resulting in postcranial developmental phases of P10 and P6 female, respectively. The left and right auricular surfaces were scored using Lovejoy et al (Buikstra and Ubelaker, 1994), resulting in a postcranial developmental phase of P8. For all three methods, these were the oldest possible postcranial developmental phases. Correlating these postcranial developmental phases for one individual (Human EA012) yielded a chronological age-at-death estimation of 60 or more years of age. It is possible that Human EA012 died at any age greater than 59 years, including a significantly advanced age.

H.3.4 Paleopathological indicators

As discussed above, the co-mingled nature of the human osteological elements recovered from Grave 020, largely as a result of disturbed tomb organization caused by later re-openings of the context (Brosseder, 2009), prevents the assignment of most skeletal materials to one human individual rather than the other (i.e., to Human EA012 rather than Human EA013).

H.3.4.1 Cranium

The only cranial elements recovered from Grave 020 and identified during laboratory analysis were an articulated mandible with 12 permanent teeth (the left and right lower second and third molars lost antemortem) and a single loose permanent upper premolar (heavily worn). No calculus or caries were observed in any of these 13 teeth. However, all 12 permanent maxillary teeth were heavily worn on their occlusal surfaces, exposing dentine on the biting surfaces. This pattern of occlusal wear was bilateral although more marked on the right mandible. The most heavily-worn teeth were the four incisors, and wear angled the occlusal surfaces to greatly reduced the labial aspect in contrast to the lingual aspect. The left and right hemispheres of mandible remodeled in response to antemortem loss of the second and third molars ($LM_{2,3}$ and $RM_{2,3}$) by reducing the corpi and widening the gonial angle.

H.3.4.2 Vertebral column

Of the 19 vertebral elements (n = 19)[136], indicators of degenerative joint disease (DJD) appear throughout the thoracic and lumbar vertebrae. In the thoracic vertebrae, signs of DJD bilaterally mark the demi-facets for rib heads in the form of macroporosity on the articular surface and exostoses around these demi-facets. In the lumbar vertebrae, exostoses appear on the ventral surfaces of all five vertebral bodies. Microporosity marks the articular surfaces between each centrum (vertebral body: superior and inferior). The inferior aspect of these centrum

[136]Complete, partial, and fragmentary vertebral elements counted.

articular surfaces are depressed, increasingly so in the fourth and fifth lumbar vertebrae (i.e., compression of vertebral bodies moving inferiorly down the vertebral column).

H.3.4.3 Thorax

The manubrium's left aspect was damaged postmortem; the manubrium's right aspect displays exostoses around the articular surface for the right first rib. The clavicular articular facets on the manubrium are worn bilaterally.

H.3.4.4 Upper limbs

One complete left scapula, one complete right scapula, and one partial right scapula were identified among the bioarchaeological assemblage from Grave 020, resulting in a *Homo sapiens* MNI of 2 (Human EA012 and Human EA013). The left scapula and one of the right scapulae manifest a large foramen-like feature in their superior margin/border just medial of the coracoid process. This trait is very likely a suprascapular foramen, formed by the ossification of the suprascapular transverse ligament, and a common nonmetric variant in the human skeleton (Mann et al., 2016). The right clavicle exhibits an unusual morphology; although the human clavicle is the most variable human osteological element (Bass, 1995; White et al., 2012), the right clavicle from Grave 020 appears to fall outside the range of standard variation. Its superior medial angle is narrow and superiorly-oriented, falling on a plane with the coracoid process. It is unclear whether this morphology resulted from genetic or congenital factors (or a combination). Few bones of the upper limbs were identified during laboratory analysis. Six complete manual proximal phalanges were identified from the Grave 020 bioarchaeological assemblage. All of their articular surfaces exhibit joint wear (lesser degree of DJD). Of these six manual proximal phalanges, one is for the right first digit (i.e., thumb). While a right first metacarpal (RMC1) was identified during laboratory analysis, it does not appear to articulate with the single proximal phalange of the thumb. Thus, these two right thumb bones do not derive from the same human individual.

H.3.4.5 Pelvic girdle

No paleopathological indicators were observed during visual inspection. A preauricular sulcus was observed on both the left and right ilia of Human EA012, which is a trait associated with female skeletal sex.

H.3.4.6 Lower limbs

No left femur was recovered from Grave 020; the right femur displays exostoses on the intertrochanteric line, rugose muscle attachment markers on all of its lines (gluteal and pectineal lines, linea aspera), and signs of DJD in the distal articular surfaces (surfaces heavily worn, surrounded by exostoses). The left and right tibiae were only partially preserved. The proximal articular surfaces of the left tibia exhibit indicators of major DJD (including exostoses around the articular surfaces' margins). The lines and other muscle attachment sites in both the left and right tibiae are robust.

H.4 Nonhuman Animals in Grave 020

H.4.1 Overview

Just under 62% of the nonhuman osteological materials[137] recovered from Grave 020 at Elst Ar and subsequently stored in the ATRC collections facility in Ulaanbaatar were identifiable to species or genus (n = 42): *Equus* sp. (n = 14), *Bos* sp. (n = 6), and *Ovis/Capra* (n = 22). Of these nonhuman animal osteological elements, *Ovis/Capra* remains comprise the majority, followed by *Equus* sp. and then *Bos* sp. remains.

The small number of elements from Grave 020 identified to taxon made it possible to estimate Minimum Number of Individuals (MNI: Lyman, 1994) for more than one element, then to cross-reference those estimates to generate a more refined MNI assessment for each taxon. While this approach has the potential to factor age-at-death estimates and skeletal sex assessments into MNI calculation, MNI in general is prone to overestimating nonhuman animal MNI (see Lyman, 1994). Skeletal sex assessment of nonhuman animal osteological materials from Grave 020 was not possible. However, age-at-death estimates based on state of osteological element development, epiphyseal closure, and dental eruption were possible for some *Equus* sp., *Bos* sp., and *Ovis/Capra* elements. Moreover, two Small bovid elements were assessed as subadult; the Small bovid taxon encompasses numerous wild and domesticated nonhuman animals, including domesticated sheep and goats (i.e., the *Ovis/Capra* taxon).

[137]Complete, partial, and fragmentary nonhuman animal osteological materials identified to taxon, body-size class, and unidentifiable were combined into a single count (n = 68).

H.4.2 Age-at-death estimation and MNI

H.4.2.1 *Equus* sp.

Nonmetric aging methods and element count/identification yielded a Minimum Number of Individual calculation of one *Equus* sp. interred in Grave 020 (MNI = 1). Age at death could not be assessed for this individual beyond complete osteological development (or skeletally 'adult'). However, one of the permanent upper cheekteeth present may have been unworn and unerupted. The postmortem damage to this tooth prevents identification of which upper premolar or molar it is. This damage also casts doubt on the interpretation that this tooth was unerupted and unworn. Horse premolars and molars (cheekteeth) erupt over a wide timespan: as early as 7 months (M1) and as late as 4.5 years (M3) (see Silver, 1969; Bennett, 2008).

The single left first rib, on the other hand, manifests paleopathological indicators that may imply advanced age (see below). However, these paleopathological indicators should not be conflated with stages or features of nonmetric traits used for age-at-death estimation without further detailed study. Therefore, the single *Equus* sp. individual is assessed as dying at a generic adult stage of osteological development. As MNI calculates the fewest individuals possibly present, it is possible that more than one *Equus* sp. had in fact been interred in Grave 020.

H.4.2.2 *Bos* sp.

Nonmetric aging methods and element count/identification yielded a Minimum Number of Individuals calculation of one *Bos* sp. individual interred in Grave 020 (MNI = 1). This individually was osteologically/skeletally subadult at the time of its death, based on the presence of epiphyseal surface on the superior margin/border of the single left scapula. However, an age range at which this finishes osteological development has not been established. A single loose permanent incisor appears to be in the process of developing, thus unerupted and unworn. Postmortem damage to this tooth prevents a confident assessment as subadult. Permanent incisors in *Bos taurus* (cow) can erupt any time between 14 and 42 months of age (see Appendix 2 in Grigson, 1982). Without an empirical basis for assessing this tooth as a specific permanent incisor (not to mention the identificatory challenge posed by postmortem damage), a narrower age-at-death estimate is not possible. Thus, the single *Bos* sp. individual interred in Grave 020 was generically subadult (skeletal/osteological basis). However, as noted above, MNI calculates the fewest possible individuals of a given taxon present; it is possible that more than one *Bos* sp. individual was placed in Grave 020.

H.4.2.3 *Ovis*/*Capra*

Nonmetric aging methods and element identification/count yielded a Minimum Number of Individuals of three (*Ovis/Capra* MNI = 3). Two adult *Ovis/Capra* were identified by the count of first phalanges and left first ribs. The third *Ovis/Capra* individual died at less than six months of age, based on stage of dental development and eruption observed in a portion of left mandible with Ldp_4 in occlusion and M_1 developing in its crypt. In sheep, dp4 erupts between birth and 6 weeks of age and M1 erupts at 3-6 months of age (Table E in Silver, 1969); in goats, dp4 erupts at 3 months of age and M1 erupts at 5-6 months of age (Table F in Silver, 1969). In Melinda Zeder's (2006) systematic study of zooarchaeological analyses of sheep and goat age at death estimation methods from dental eruption and epiphyseal fusion data, dp4 is erupted and in wear by 6 weeks and 2 months of age, respectively. In the same study, M1 is erupted and in wear by 6 months in sheep, and by 2 months in goats. Following Silver (1969), this subadult/infantile *Ovis/Capra* individual died between birth and six months of age.

The presence of Ldp4 and the appearance of M1 developing in its crypt suggest a very young *Ovis/Capra* individual, plus the overall size and fragility of the element. As M1 erupts in sheep and goats between 2 and 6 months of age (Zeder, 2006), this suggests that the subadult *Ovis/Capra* individual was in fact a lamb or kid, perhaps still nursing and not yet (fully) weaned when it died. The presence of a Small bovid right occipital condyle unfused to either the squama or basilar portions (Small bovid can technically encompass specimens from the *Ovis/Capra* taxon) suggests a fairly young individual. Zooarchaeological methods for aging nonhuman animal remains based on development and stage of epiphyseal fusion usually do not include cranial development beyond the dentition (eruption and wear). The most conservative age-at-death estimate based on available evidence and following Zeder (2006) is less than 6 months of age for this lamb or kid.

H.4.3 Paleopathological indicators

Two nonhuman osteological elements recovered from Grave 020 display signs of paleopathology. The first is the *Equus* sp. left first rib. The three costal facets (i.e., rib head and tubercle) manifest rimming around their articular surfaces, which include exostoses (DJD). The second is the *Bos* sp. left scapula. Histological reaction marks the medial aspect of the superior portion of the blade.

H.4.4 Seasonality profile

The age-at-death estimations for one osteologically subadult *tavan khoshuu mal* elements discussed above were used to generate a seasonality profile for Grave 020: the *Ovis/Capra* individual (lamb or kid) who died between birth and 6 months of age. Following Sambuu's (1945/2000) *tavan khoshuu mal* breeding and birthing schedule[138], the Xiongnu community at Elst Ar engaged in the mortuary practices that generated Grave 020 between mid-March and mid-October. When the age-at-death estimate for the lamb or kid is correlated to Erdenetsogt's (2014) *tavan khoshuu mal* breeding and birthing schedule, the seasonality profile for Grave 020 remains identical: mid-March through mid-October.

[138]See Appendix C.

H.4.5 Discoloration of osteological elements

Evidence that an iron object was in contact with the *Bos* sp. left scapula after the element had been defleshed appears as a reddish stain on the glenoid and medial aspect of the scapula. However, the 2013 report on 2012 excavations of Grave 020 at Elst Ar (Erdenebold et al., n.d.b) does not list any metal objects as recovered from this mortuary context.

APPENDIX I

GRAVE 021

I.1 Overview of Grave 021

Grave 021 contained a minimum of three individuals: one human who died over 49 years of age who was skeletally female, one human of indeterminate sex who likely died between 18 and 21 years of age (*Homo sapiens* MNI = 2), and one subadult sheep that after its second full year of life but before it reach four years of age (*Ovis aries* MNI = 1). Grave 021 is one of two mortuary contexts from Elst Ar analyzed in this project that yielded a single nonhuman animal (along with Grave 012), and the only mortuary context with only *Ovis aries*/sheep for the nonhuman animal component of the relational osteobiography. The comingled nature of the *Homo sapiens* osteological elements as encountered during the excavation of Grave 021 render individual osteobiographies difficult to generate. However, bioarchaeological analysis of the two complete mandibles and the single complete pelvic girdle yields empirical justification for positing osteobiographical information about the two human individuals (Human EA014 and Human EA015) interred in Grave 021.

I.2 Contextual Information on Grave 021 from The Mongolian Field Report

According to the 2012 field report on the 2011 excavations at Elst Ar, Grave 021 has a circular stone surface feature with a diameter of 8 meters located in the southwestern section of the Xiongnu cemetery. The Elst Ar site map depicts Grave 021 as the westernmost mortuary context in the Xiongnu cemetery (Erdenebold et al., 2012). After cleaning the stone surface circle, excavators hit the *tolbo* (*tolbo*: gravecut in this context) at 60 cm, and it continued (changing shape as it went downward) to 190 cm. At 210 cm, excavators uncovered a stone cist measuring 250 cm in length, 100 cm at the head, and 90 cm at the foot. Excavators found a human cranium in the northeastern corner of the stone enclosure (that was not identified in the Grave 021 mortuary assemblage from Elst Ar stored in the ATRC collection facility in Ulaanbaatar), and a sheep/goat scapula in the northwestern corner. Immediately in front of/to the south of the human cranium excavators detected wooden fragments (type, size, and count unspecified: see line drawing on page 29 of Erdenebold et al., 2012). At 300 cm the limb bones were found in anatomical position and the bones of the thorax/chest were jumbled together[139]. Underneath these human remains excavators found fragments of a wooden pallet or mat.

The 2012 field report on the excavation of Grave 021 at Elst Ar documents a number of small finds: a fragment of a bronze mirror[140]; a (worked nonhuman animal) bone hairpin; a human C2/axis with lacquer adhering to it; seven fragments of (worked nonhuman animal) bone chopsticks; an iron item[141]; and a poorly-preserved iron object, which the report hypothesizes was an iron fastener or clasp for the outer/wooden coffin. The report further describes the iron fastener/clasp as adhering to lacquer-decorated wood (presumably coffin wood) on one side, which depicts the üülen khee[142] үүлэн хээ design (see Erdenebold et al., n.d.a). A schematic of the tomb at the depth at which most of the human remains, the wooden mat/floor of the tomb,

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[139] The 2012 Elst Ar report implies postdepositional disturbance of the human skeleton's original position (Erdenebold et al., n.d.a)
[140] Appears in the report's figures to be a bronze mirror.
[141] "*Üldegdel*" (үлдэгдэл), which here appears to a small bit of iron slag.
[142] *Üülen khee* (үүлэн хээ: "cloud pattern") in Mongolian generally refers to the cloud pattern, one of several established patterns, or "хээ" (*khee*), within Mongolian visual arts. The image quality for the lacquered wooden fragment prevents confirmation that this is specifically the *üülen khee* pattern, rather than a more general description of clouds.

faunal remains, and a number of small finds were encountered during excavation is shown in the 2012 report (Erdenebold et al., n.d.a). None of these small finds, including the worked nonhuman animal bone artifact and the human C2, excavated from Grave 021 were available for analysis during the laboratory phase of this project.

I.3 Humans in Grave 021

I.3.1 Overview of Human EA014 and Human EA015

158 human skeletal remains were identified from the osteological materials recovered from Grave 021 at Elst Ar (*Homo sapiens* n = 158)[143]. The co-mingled nature of these materials as encountered during the initial excavation (Erdenebold et al., n.d.a) and subsequent storage in the ATRC collections facility make reconstruction of human individuals from osteological materials and estimation of skeleton completeness highly challenging.

Osteological elements from a minimum of two human individuals were interred in Grave 021 at Elst Ar: Human EA014 and Human EA015 (*Homo sapiens* MNI = 2). The *Homo sapiens* MNI derives from the presence of two complete articulated mandibles, two partial right temporal bones, and two partially-fused sterna. If the C2 described and photographed in the 2011 report (Erdenebold et al., n.d.a), then the C2count further supports the estimated *Homo sapiens* MNI (i.e., C2 n = 2). Aside from these osteological elements, it is challenging to assign specific osteological elements to one individual (Human EA014) vs. the second individual (Human

[143]Complete, partial, and fragmentary human osteological elements were counted together, along with all teeth found loose or still in their alveoli. If the human C2 recovered from Grave 021 with lacquer adhering to it is included in this count, the *Homo sapiens* n = 155.

EA015) when those elements manifest no traits and features associated with skeletal sex or age at death. However, as seen below, the complete pelvic girdle (left and right os coxae) will be assigned to one of the articulated mandibles into Human EA014 based on the skeletal sex assessment and age-at-death estimation for the complete pelvic girdle (see below), and the second mandible as that of Human EA015.

I.3.2 Skeletal sex assessment

One complete pelvic girdle (left and right os coxae: ilia, pubis, and ischium) bearing some postmortem damage was found in Grave 021. These elements preserved osteological traits and features that yielded assessment of skeletal sex using bioarchaeological methods deployed in this project (Buikstra and Ubelaker, 1994; Klales et al., 2012). These traits and features of the pelvic girdle are: greater sciatic notch; ventral arc; subpubic concavity; and ischiopubic/medial ramus ridge. Moreover, a preauricular sulcus – an osteological trait generally scored as skeletally female (Buikstra and Ubelaker, 1994; Mann et al., 2016) – was observed on both the left and right ilia. The scoring of these traits and features yielded a skeletal sex assessment of probably female (highly likely). This complete pelvic girdle was subjected to bioarchaeological methods for estimating age at death (see below).

I.3.3 Age-at-death estimation

The articulated mandible of Human EA015 contains erupting LM_3 and RM_3 that are not yet in full occlusion. In modern *Homo sapiens*, the third molars begin to erupt around 18 years of age (or 19 years of age: Hillson, 2014) and reach full occlusion at around 21 years of age (Miles, 1963; Buikstra and Ubelaker, 1994). As the third molars in Human EA015's mandible are not yet in full occlusion, it is possible that they died closer to 20 or 21 years of age. The more conservative age-at-death estimation would be between 18 and 21 years of age for Human EA015. The second articulated mandible displays adult development and permanent dentition only.

While the left and right pubic symphyses were too damaged, the auricular surfaces of the left and right ilia preserved traits and features suitable for age-at-death estimation using methods deployed in this project (Buikstra and Ubelaker, 1994; Klales et al., 2012). Using Lovejoy et al.'s methodologies, the two sacro-iliac joint surfaces indicate an individual who died over 50 years of age. This age-at-death estimation derives from the scoring of features of auricular surface as consistent with P7 and P8 postcranial developmental phases, which are chronologically correlated with 50-59 and 60+ years at death age estimations, respectively (Buikstra and Ubelaker, 1994). The 60+ years chronological age category (i.e., P8) contains no age cap (maximum age). Thus, this individual may have died at any age greater than 49 years, and may have died at a significantly more advanced chronological age.

Under normal circumstances, an individual with this age-at-death estimation based on features of the pelvic girdle would not possess a mandible still undergoing dental eruption. Assigning the pelvic girdle and the adult mandible to one individual – Human EA014 – would be a reasonable inference from the available evidence. However, these left and right ilia were in contact bilaterally with the *dorsal* wall of the sacrum at the second sacral body, and sites of contact ("false joints") are visible on the retroauricular area of each ilium. These morphological changes to the pelvic girdle may impact wear and changes to the auricular surfaces, which would complicate age-at-death estimations from these joint surfaces using Lovejoy et al. (see Buikstra and Ubelaker, 1994). These paleopathological indicators within the pelvic girdle and their implications will be discussed in more detail below in the *Paleopathological Indicators* subsection. Thus, it is technically possible that this pelvic girdle belongs to Human EA015, or to one or two additional human individuals not accounted for in *Homo sapiens* MNI. However, the more parsimonious explanation is that the (skeletally-female) pelvic girdle with an estimated age at death of over the age of 49 belonged to the same individual as the adult mandible (i.e., Human EA014).

The complete pelvic girdle was also subjected to methods for assessing skeletal sex (see above).

I.3.4 Paleopathological indicators

I.3.4.1 Overview

As discussed above, the co-mingled nature of human osteological elements as encountered when Grave 021 was excavated in 2011 presents a significant challenge to assigning elements to one individual (Human EA014) rather than the other (Human EA015). It is therefore difficult and perhaps inadvisable to generate a paleopathological profile as an individual osteobiography for the humans of Grave 021. Instead, the subsections below will describe paleopathological indicators of trauma, degenerative joint disease (DJD), and histological reaction (as a sign of osteological tissue infection), along with the observation of any nonmetric traits often used in biodistance or population affinity analyses. When empirical evidence supports the assignment of specific osteological elements to Human EA014 (skeletally-female individual who died over 49 years of age) rather than Human EA015 (individual of indeterminate skeletal sex who died between 18 and 21 years of age), the rationale for the assignment will be presented. For example, the pelvic girdle – the sacrum and left and right ilia – recovered from Grave 021 belong to Human EA014. The left and right ilia, as discussed in the sections on age-at-death estimation and skeletal sex assessment, belong to the same human individual. Both ilia present paleopathological indicators mirrored on the single preserved sacrum (see below). Thus, empirical evidence supports the interpretation that Human EA014 was an older skeletally-female individual who likely experienced lower back pain and some to significant impairment of mobility (and possibly other functions) for some or all of her life.

I.3.4.2 Cranium

The only cranial remains within the human osteological assemblage from Grave 021 at Elst Ar identified during laboratory analysis were two articulated mandibles containing permanent dentition, two right temporal bone fragments, one fragment of sphenoid, and seven loose permanent teeth (two upper central incisors, one upper lateral incisor, one upper premolar, two lower premolars, and one lower incisor). Both articulated mandibles display paleopathological indicators.

The complete mandible with only fully-erupted permanent dentition is argued to belong to Human EA014 (see *Age-at-death estimation* subsection above). Human EA014's mandible contains four permanent teeth still in their alveoli: left lower 2nd premolar (LP_4); left lower canine (/C); right lower 2nd premolar (RP_4); and right lower first molar (RM_1). At the time of Human

EA014's death, the alveolus/crypt for LM_3 had completely resorbed, indicating antemortem tooth loss. The empty alveoli for LM_1, RM_2, and RM_3 display indicators of histological reaction, with an abscess formed at RM_3; the empty crypt/alveoli for RM_3 displays porosity and a new opening in new bony growth.

The second complete mandible, which has erupting permanent lower third molars (LM_3 and RM_3), belongs to Human EA015. Although this second mandible is osteologically/dentally subadult, due to the in-process dental eruption of LM_3 and RM_3, it lost several permanent/adult teeth while Human EA015 was still alive: left second molar (LM2), left second premolar (LP4), and right canine (R/C). Where the alveoli for LP4 and LM2 are fully resorbed, the empty crypt/alveolus for the lower right canine (R/C) is in the process of resorbing and shows signs of histological reaction (i.e., infection) around the crypt. Empty and unabsorbed alveoli for numerous permanent adult teeth – LP3, L/C, LI2, LI1, RI1, RI2, RP3, and RP4 – suggest that these teeth fell out of their sockets/crypts/alveoli after Human EA015 died and a sufficient amount of soft tissue decayed.

I.3.4.3 *Vertebral column*

Signs of degenerative joint disease (DJD) appear throughout the vertebral elements recovered from Grave 021. Schmorl's nodes mark the inferior centrum articular surface in two indeterminate thoracic vertebrae. Small exostoses appear around most of these intervertebral articular facets, especially in the thoracic and lumbar vertebrae, and these articular surfaces/facets also exhibit wear. The costal facets for rib heads and rib tubercles display macroporosity and exostoses throughout the thoracic vertebrae. The single sacrum – complete and largely preserved – recovered from Grave 021 exhibits what appear to be two sites of articulation between the sacrum and the left and right ilium. Microporosity marks the articular surfaces for the L5 and the left and right ilia, and small exostoses appear on the dorsal wall. At the dorsal wall of the second sacral body (S2), a pair of "false joints" formed through paleopathological contact between the two osteological elements, resulting in articulating bony growths forming at some point during the individual's lifetime. These might be classified as accessory facets between the sacrum and the left and right ilia (see Mann et al., 2016: 598).

I.3.4.4 Thorax

The superior aspect of the right first rib is stained green, consistent with prolonged contact with bronze or a bronze-alloy metal. Many preserved rib heads and some rib tubercles exhibit macroporosity where they articulate with the thoracic spine; some of these articular surfaces have developed irregular morphologies. These paleopathological indicators consistent with DJD are mirrored in the thoracic vertebrae described above.

I.3.4.5 Upper limbs

An almost rectangular small depression marks the superior border of the left scapula, presenting an unusual variation of the suprascapular notch that may relate to the ossification of the suprascapular ligament. No such paleopathological indicators were observed in the right scapula. The partial right clavicle displays a lumpy, rugose muscle attachment site near the head at the inferior aspect. The partial left humerus (distal portion) exhibits a septal aperture (i.e., perforated trochlea: see Mann et al., 2016), a nonmetric trait and anatomical variant seen in other human individuals from Elst Ar.

I.3.4.6 Pelvic girdle

The paleopathological indicators on the sacrum (bilateral "false joint" articular sites at the dorsal wall of the second sacral body) mirror the presentation of the preserved left and right ilia, where these two "false joints" would have formed. A major bony growth (bony deposit) marks each retroauricular area posterior to the auricular surface of both the left and right ilia, with a surface indicating paleopathological contact with the sacrum (in this case, S2). It is unclear whether this unusual morphology was congenital or the result of physical trauma; however, it likely impacted the individual (Human EA015) in terms of pain and restricted mobility for some or all of her life.

I.3.4.7 Lower limbs

The left patella presents a very unusual morphology: a lunate-shaped "chunk" seems to have been extracted or broken off of the main body antemortem. Where this chunk is missing, the cortical bone displays histological reaction and exostoses. No clear paleopathological indicators that mirror this presentation were observed in the left femur, tibia, or fibula. However, this may be due to the fact that the patella is a sesamoid bone and embedded in ligament. The most parsimonious explanation for this presentation is that the left patella is bipartite, with the separate ossicle (i.e., unfused patellar epiphysis) having been lost during excavation or storage (see Mann et al., 2016: 623-625). The histological reaction and exostoses observed on the left patella may have resulted from the bipartite patella, or from separate infectious or traumatic incidents to the left knee. The left fibula displays microporosity on the distal aspect of the articular site for the left tibia.

I.4 Nonhuman Animals in Grave 021

I.4.1 Overview

Just over 53% of the nonhuman animal osteological materials (total zooarchaeological n = 47) recovered from Grave 021 and stored in the ATRC collections facility in Ulaanbaatar were identifiable to genus or taxon (*Ovis aries* n = 2; *Ovis/Capra* n = 23). *Ovis aries* (domesticated sheep) elements comprised 8% of those osteological materials (n = 2); *Ovis/Capra* comprised the remaining 92% (n = 23). The nonhuman osteological materials that comprised the remainder of the zooarchaeological assemblage from Grave 021 were identified as Small ungulate (n = 22). As the Small ungulate body-size class can technically encompass the *Ovis/Capra* taxon, and the *Ovis/Capra* taxon technically encompasses the *Ovis aries* taxon, osteological elements from all three taxa only represent different individual animals (MNI) if there are repeated elements (i.e., two right femora) found in Grave 021.

The small number of elements from Grave 021 identified *Ovis aries*, *Ovis/Capra*, and Small ungulate made it possible to estimate Minimum Number of Individuals (MNI: Lyman, 1994) for more than one element, then to cross-reference those estimates to generate a more refined MNI assessment. While this approach has the potential to factor age-at-death estimates and skeletal sex assessments into MNI calculation, MNI in general is prone to overestimating nonhuman animal MNI (see Lyman, 1994). Skeletal sex assessment of nonhuman animal osteological materials from Grave 021 was not possible. However, age-at-death estimates based on state of epiphyseal closure/fusion were possible for *Ovis aries, Ovis/Capra,* and Small ungulate elements. The two *Ovis aries* (sheep) osteological elements identified from the Grave 021 zooarchaeological assemblage were a subadult right femur and a left scapula, following Boessneck et al.'s (1964) methods for differentiating these osteologically-similar taxa based on nonmetric traits.

I.4.2 Age-at-death estimation

A minimum of one subadult *Ovis aries* individual (or its component parts) was interred in Grave 021 at Elst Ar (MNI = 1). The nonhuman animal MNI estimate for Grave 021 is based on a comparison and count of *Ovis aries* (subadult n = 1), *Ovis/Capra* (subadult n = 23), and Small ungulate elements (subadult n = 20). The only subadult element from Grave 021 for which a range of age-at-death estimation has been established by prior zooarchaeological research is the femur. According to Melinda Zeder's (2006) evaluation and compilation of previous sheep and goat dental eruption and epiphyseal fusion data, the distal and proximal femoral epiphyses fuse in *Ovis aries* (sheep) between 30 and 48 months (Fig. 15 in Zeder, 2006). Both the proximal and distal epiphyses in this right femur display a line of fusion, indicating that epiphyseal fusion is close to complete and that the sheep in question died close to this age range. While this sheep was skeletally (osteologically) subadult, it would have reached sexual maturity before 30 months of age, aged out of the "hogget"[144] category, and thus may not have been considered "culturally" subadult. However, given the established age range for femoral epiphyseal closure in sheep (see Zeder, 2006), this sheep died before it reached 48 months (or four years) of age.

I.4.3 Seasonality profile

The age-at-death estimations for the osteologically subadult *tavan khoshuu mal* elements discussed above did not yield sufficient empirical evidence from which to generate a seasonality profile for Grave 021.

I.4.4 Discoloration and evidence of burning

Nonhuman animal osteological elements identified in the zooarchaeological assemblage from Grave 021 at Elst Ar display discoloration across all three taxa identified. The single *Ovis aries* subadult right femur exhibits major reddish (i.e., iron) staining on the medial and cranial aspects of its distal portion. The single *Ovis/Capra* left scapula shows patches of discoloration across the element (of uncertain origin). Two Small ungulate rib fragments bear dark discoloration that does not appear to be the result of burning, although the cause is uncertain.

[144]A hogget is a domesticated sheep (*Ovis aries*) in its second full year of life.

APPENDIX J

GRAVE 013

J.1 Overview of Grave 013

Grave 013 contained a minimum of four individuals: one human (MNI = 1), an individual with an ambiguous skeletal sex who died between 30 and 35 years of age; one adult cow (MNI = 1); and two sheep/goat (MNI = 2), a lamb/kid who died before reaching 3 months of age, and an individual who died before 28 months.

J.2 Contextual Information on Grave 013 from The Mongolian Field Report

According to the 2013 report (Erdenebold et al., n.d.b) on 2012 excavations at Elst Ar, Grave 013 has a circular rock-ring surface feature with a diameter of 7 m in the southern portion of the Xiongnu cemetery. As archaeologists excavated down 1 m into the grave, they uncovered a coffin nail (unclear whether metal or wood) and some worked bone fragments[145]. The толбо began at 1.7 m, narrowing down for another 1.5 m[146]. Fifty cm below the end of the *tolbo*, excavators encountered a stone cist along with human and animal bone. The field report concludes that Grave 013 had been robbed due to the positioning of the human remains (unspecified count or sided femur, unspecified bones of the chest, pelvic girdle, and head) here at 2.2 m deep (or at 2 m deep, report is confusingly written). At 1.65 m excavators found an iron

[145]The report records the bone items as *yasan edlel* (ясан эдлэл: “bone things/items”), which implies worked bone in this context.
[146]Or possibly just 1.5 m down from surface level.

coffin nail and worked bone decorations[147]. Excavators uncovered more human bone and worked bone items at 2.41 m; although broken, the left and right tibiae and right fibula were found in anatomical position (inferring from written report, drawings, and photos of grave). At this level, excavators also found additional human skeletal remains and nonhuman animal remains. The human remains consisted of ribs, vertebrae, humerus (side not specified), radius and ulna (sides not specified), innominate (completeness and side not specified), and a complete mandible. The nonhuman animal skeletal remains consisted of sheep/goat phalanges[148]. Under these human remains excavators uncovered a wooden coffin floor or mat in poor condition. Ground was sterile/noncultural below this depth.

The worked bone items recovered from Grave 013 that were photographed and drawn for the 2013 field report are remarkable (See Figures). Particularly striking is the somewhat trident-shaped fragment of worked bone (2 cm by 2.5 cm) affixed to an iron fragment. Unfortunately, the report does not clarify the depth at which these items were found or suggest their nature.

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[147]It remains unclear how this account accords with the description of a coffin nail and worked bone items found earlier in the report (Erdenebold et al., n.d.b).

[148]*Bog malyn tuurai*, *tagaltsag* (бог малын туурай, тагалцаг: bog malyn tuurai, tagaltsag) are Mongolian language veterinary and animal husbandry terms. For sheep and goat (*bog mal*), *tuurai* (туурай) is "coffin bone and *tagaltsag* (тагалцаг) is "pastern bone". The coffin bone is the distal/third phalange; pastern bones could either refer to the proximal/first phalange and/or the intermediate/second phalange. Thus I have translated the phrase as the somewhat-imprecise "sheep/goat phalanges".

J.3 Humans in Grave 013

J.3.1 Human EA08

Osteological elements from a minimum of one human individual were recovered from Grave 013 at Elst Ar: Human EA08 (*Homo sapiens* MNI = 1). Roughly 45% of a complete human skeleton was identified, or 94 osteological elements and fragments (n = 94)[149]. Aside from articulated left and right hemispheres comprising a mandible with 10 permanent teeth in their alveoli (and one loose tooth), no human cranial elements were found in Grave 013. As a result, skeletal sex assessment and age-at-death estimation relied solely on postcranial elements.

J.3.2 Skeletal sex assessment

Postmortem damage to the pelvic girdle obliterated several features of the pubis used to assess skeletal sex: ventral arc and ischiopubic/medial ramus ridge (Buikstra and Ubelaker, 1994). The remaining nonmetric traits of the pelvic girdle suggest that Human EA08 was possibly female. No preauricular sulcus appeared in either ilium. While bioarchaeological methods for skeletal sex assessment often score the presence (skeletally female) or absence (skeletally male) of a preauricular sulcus (Bass, 1995; White, 2000), recent research urges caution when applying this method (Karsten, 2018). If skeletal sex assessment incorporated the absence of a preauricular sulcus, Human EA08 would present an indeterminate skeletal sex; if the trait is not scored, Human EA08 presents a possibly female skeletal sex. The limited number

[149]The articulated mandible and all teeth (loose and in their alveoli) were each counted as separate osteological elements.

of sex-linked traits preserved in the pelvic girdle of Human EA08 necessitates a cautious skeletal sex assessment.

J.3.3 Age-at-death estimation

Postmortem damage to the pubic symphyses in the pelvic girdle of Human EA08 prevent aging of these surfaces. The auricular surface of the left and right ilia were preserved and scoreable following Lovejoy et al. (Buikstra and Ubelaker, 1994). The resulting age-at-death for Human EA08 is 30 to 35 years of age.

J.3.4 Paleopathological indicators

Relatively few paleopathologies were observed in the osteological elements that comprised Human EA08.

J.3.4.1 Cranium

Only a complete mandible with 10 teeth in situ (and one loose lower incisor) comprised the cranial elements of Human EA08. No paleopathological indicators appear in the teeth or jaw bone; the empty alveoli suggest that the missing teeth were lost postmortem.

J.3.4.2 Vertebral column

Signs of degenerative joint disease (DJD) manifest in the centrum-to-centrum articular surfaces of thoracic and lumbar sections of Human EA08's vertebral column: microporosity, thickening of the borders around these articular surfaces, bony deposits, and inclusions (lumbar vertebrae only). The superior articular facets on sacrum for the fifth lumbar vertebra (L5) deviate from standard presentation in terms of their orientation.

J.3.4.3 Thorax

A left rib displays a depression in its tubercle and a healed fracture in its shaft.

J.3.4.4 Upper limbs

The distal portion of the left humerus manifests a nonmetric trait: a perforation superior to the trochlea (i.e., supratrochlear foramen or septal aperture). Septal aperture of the distal humerus has been noted in research since the 19th century in *Homo sapiens* and various nonhuman animals; within humans, septal aperture incident varies by population (Hrdlička, 1932). Although the proximal cause remains debated, recent research supports the observation that septal aperture of the distal humerus is more common in female individuals and in left elements (Mays, 2008; Bradshaw et al., 2020).

J.3.4.5 Pelvic girdle

No paleopathological indicators observed, but the pelvic girdle suffered some postmortem damage that may obscure signs of infection, trauma, and other paleopathologies.

J.3.4.6 Lower limbs

Histological reaction appears on the inferior surface of the left femoral neck. Parallel histological reaction in the left acetabulum was not observed.

J.4 Nonhuman Animals in Grave 013

J.4.1 Overview

Just under 43% of the nonhuman osteological materials recovered from Grave 013 at Elst Ar and subsequently stored in the ATRC/SHUTIS collections facility in Ulaanbaatar were identifiable to species or genus. *Bos* sp. and *Ovis/Capra* elements comprised the entirety of nonhuman osteological elements identified to taxon (n = 30).

The small number of nonhuman animal elements from Grave 013 identified as *Bos* sp. or *Ovis/Capra* made it possible to estimate Minimum Number of Individuals (MNI: Lyman, 1994) for both taxa. MNI estimation for each taxon examined the most abundant element, then cross-referenced those estimates with the second-most abundant element to generate a more refined MNI assessment. While this approach has the potential to factor age-at-death estimates and skeletal sex assessments into MNI calculation, MNI in general is prone to overestimating nonhuman animal MNI (see Lyman, 1994). Skeletal sex assessment of nonhuman animal osteological materials from Grave 013 was not possible. However, age-at-death estimates based on state of epiphyseal closure and dental eruption were possible for some *Bos* sp. and *Ovis/Capra* elements.

J.4.2 Age-at-death estimation

Nonmetric aging methods yielded a minimum of one subadult *Bos* sp. individual and one subadult *Ovis/Capra* individual (or their component parts) who comprised the zooarchaeological assemblage from Grave 013 (nonhuman animal MNI = 2).

A number of postcranial Large bovid[150] elements from Grave 013 include unfused or fusing epiphyses. Unfortunately, well-established chronological timing has not been established for the Large bovid or *Bos* sp. elements still undergoing osteological development (see Grigson, 1982). Thus, while this individual was skeletally subadult, it does not follow that it was biologically subadult in other senses (i.e., behavioral, soft tissue, etc.). In contrast, unfused long bones that comprised the subadult *Ovis/Capra* individual may be assessed to approximate chronological ages; the result is an *Ovis/Capra* individual who died less than 12-18 months of age. This individual was either a younger hogget[151] or yearling goat, or a lamb or kid. However, there is a Small bovid (Russell, n.d.) left mandibular fragment damaged postmortem. It is difficult to estimate the age at death for this individual, but the alveolus for Ldp4 and the lack of

[150]'Large bovid' is a taxonomic category for zooarchaeological analysis distinct from *Bos* sp. (see Appendix D.2.1; Russell, n.d). However, the Large bovid osteological elements from Grave 013 are consistent with the single *Bos* sp. individual interred therein (MNI = 1), rather than necessarily representing a second individual.
[151]A hogget is a sheep in its second full year of life.

space in the corpus for M1 suggests a very young individual, plus the overall size and fragility of the element. As M1 erupts in sheep and goats between 2 and 6 months of age (Zeder, 2006), this suggests that the subadult *Ovis/Capra* individual was in fact a lamb or kid, perhaps still nursing and not yet (fully) weaned when it died.

J.4.3 Paleopathological indicators

A single osteological element assessed as a *Bos* sp. intermediate/second phalanx/phalange displays a paleopathological indicator in the form of a stress fracture (unhealed at the time of death) on the dorsal surface's proximal aspect. For the possibility that paleopathological indicators in cattle phalanges are indicative of traction, see Appendix G[152]. As was the case for these observations in Grave 012 at Elst Ar, an unhealed stress fracture in a *Bos* sp. second/intermediate phalange is suggestive but insufficient for asserting that the biomechanical stress associated with heavy load pulling caused this pathology. The question of traction for the *Bos* sp. specimens from Elst Ar requires further paleopathological analysis using targeted methodologies (see Telldahl, 2012, for description of some approaches).

J.4.4 Seasonality profile

The age-at-death estimations for one osteologically subadult *tavan khoshuu mal* elements discussed above were used to generate a seasonality profile for Grave 013: the fetal/neonate

[152]Appendix G describes how a number of *Bos* sp. proximal/first phalanges, intermediate/second phalange, and distal/third phalanges displaying such indicators were identified in the zooarchaeological assemblage from Grave 012.

Ovis/Capra individual (lamb or kid) died between birth and 3 months of age. The age-at-death estimate for the lamb or kid yields a narrow temporal window within which this individual died, which provides a key datapoint in seasonality profile generation. Following Sambuu's (1945/2000) *tavan khoshuu mal* breeding and birthing schedule[153], the Xiongnu community at Elst Ar engaged in the mortuary practices that generated Grave 013 between mid-March and mid-July. Similarly, when the age-at-death estimate for the lamb or kid is correlated to Erdenetsogt's (2014) *tavan khoshuu mal* breeding and birthing schedule, the seasonality profile for Grave 013 remains identical: mid-March through mid-July.

J.4.5 Worked nonhuman animal bone

Numerous fragments of worked nonhuman animal bone were photographed and mentioned in the 2012 field report as recovered from Grave 013 at Elst Ar (Erdenebold et al., n.d.b). These finds were not available during laboratory analysis and were not stored with the zooarchaeological/osteological assemblage recovered from Grave 013 in the ATRC archaeological collections storage facility at SHUTIS in Ulaanbaatar. The precise provenance of each find is not specified in the 2012 report. According to the descriptions for photographs of these finds from the 2012 report, the first worked nonhuman animal bone find is now in two pieces, and the second collection comprises five fragments.

[153] See Appendix C.

APPENDIX K

GRAVE 015

K.1 Overview of Grave 015

Grave 015 contained a minimum of five individuals: a human adult of indeterminate age at death and skeletal sex (*Homo sapiens* MNI = 1); two cattle (*Bos* sp. MNI = 2); and two sheep/goat (*Ovis/Capra* MNI = 2). Both cattle were skeletally subadult but died over 18-24 months of age; one sheep/goat was skeletally subadult and died younger than 12-18 months of age, whereas the second sheep/goat was an adult who died over 12-18 months of age.

Therefore, at least five individuals (or some of their body parts) were intentionally assembled together during mortuary ritual and the creation of mortuary space (Grave 013) by members of the Xiongnu community at Elst Ar. However, as discussed below, the 2012 report on 2011 excavations at Elst Ar list numerous nonhuman animal remains discovered in Grave 015 that were not present in the zooarchaeological assemblage stored at ATRC at the time of laboratory analyses.

Contextual information does not allow reconstruction of individual nonhuman animal bodies; moreover, that more than one human was originally interred in Grave 012 cannot be ruled out. The 2011 Mongolian field report on excavations at Elst Ar indicates that Grave 013 was disturbed, as a number of the wooden planks serving as the outer coffin lid were missing and human remains were recovered outside of this wooden outer coffin. As a result, the following analysis characterizes Grave 015 has having been re-opened (see Brosseder, 2009) after the mortuary rituals that initially assembled Humans EA18 and the four nonhuman domesticated animals in the tomb. It is possible that components of the mortuary assemblage in Grave 015, including portions of the multispecies assemblage, were placed there during subsequent intrusions into or re-openings of the grave. In particular, the sheep/goat "shank" (see below) and fragment(s) of ceramic vessel discovered during the cleaning of Grave 015's surface feature could indicate practices of return to this mortuary context (or items taken out of Grave 015 but left onsite).

K.2 Contextual Information on Grave 015 from The Mongolian Field Report

According to the 2012 field report on the 2011 excavations at Elst Ar, Grave 015 has a circular stone surface feature with a diameter of 8 meters located in the southern section of the Xiongnu cemetery. As archaeologists cleaned the surface feature, they uncovered broken pottery (sherds) and "sheep/goat shank"[154] amidst the stone in the southeastern portion of the stone circle. Unfortunately, the report does not provide photos of these subsurface finds (depth not recorded) or discuss them further; the count and wholeness of the sheep/goat 'shin bones' are unclear. Excavators reached the толбо (gravecut/gravefill) at 20 cm; following the толбо downward, at 320 cm they uncovered a wooden outer coffin of 250 cm in length, 100 cm width at the head, 90 cm width at the feet, and 10 cm width for the planks. The wooden outer coffin is missing cover planks from the head of the coffin to the human inside's chest region; 14 wooden over planks remained in place and intact.

[154] As discussed previously, *bog mal* refers to sheep and goat; this aligns well with the zooarchaeological category, 'sheep/goat'. "Shank" here poses a problem; in English, the term could denote either 'foreshank' (radius) or 'hindshank' (tibia). The Mongolian term, *shaant* (шаант), here is given no directional or anatomical modifiers; it remains unclear whether this was a sheep/goat radius, sheep/goat tibia, or other sheep/goat limb bone (such as a metapodial).

In a niche just above and beyond the wooden outer coffin were two cattle skulls facing north placed side by side; to the immediate right/east of the eastern cattle skull, excavators found a large ungulate (cow, horse, and camel) scapula. A left large bovid scapula was identified from the osteological materials labeled Grave 015 in the ATRC collections facility; however, no additional contextual information was available for the element and it is thus not possible to verify that this was the scapula found with the two cattle crania. These two largely-intact (based on the field report photograph) cattle crania were not present in the osteological materials labeled Grave 015 in the ATRC, MUST/SHUTIS, in Ulaanbaatar. However, numerous loose large bovid teeth were.

Excavating underneath the niche (unclear if digging inside the wooden outer coffin or actually directly under the niche) revealed "14 sheep/goat head, C1, C2, short rib[155], and lower leg bones[156] placed together (three kids, one lamb, ten goats, and two sheep)". What the count of 14 denotes is unclear; no *Ovis/Capra* complete articulated crania or cranial fragments (aside from loose teeth) were identified in the osteological remains labeled Grave 015 in the ATRC collections facility in Ulaanbaatar.

The wooden outer coffin housed an interior stone cist/enclosure measuring 190 cm in length, 60 cm at the head, and 50 cm at the foot. Inside the stone cist/enclosure, human lower limbs were arranged in anatomical position; underneath these were fragments of a bronze mirror and bone chopsticks.

Obvious discrepancies exist between the 2012 report (Erdenebold et al., n.d.a) on the 2011 excavation of Grave 015 and the results of osteobiographical analyses conducted on the

[155]Possibly a first rib.
[156]*Shiir* (шийр) is an animal's lower leg (Bawden, 1997). These elements could be metapodials, but the report does not specify.

materials from Grave 015 in Ulaanbaatar. The numerous sheep and goat crania and postcranial elements listed in the field report were not present in the Grave 015-labeled osteological materials at ATRC in Ulaanbaatar. It remains a serious question as to whether Grave 015 is thus suitable for relational osteobiographical analysis, as skeletal materials from the mortuary context are known to be missing.

K.3 Humans in Grave 015

K.3.1 Overview of Human EA018

The highly degraded osteological remains of a minimum of one human were recovered from Grave 015 at Elst Ar, Human EA018 (*Homo sapiens* MNI = 1). The poorly-preserved nature of these osteological materials presents significant challenges to skeletal sex assessment and age-at-death estimation analyses for Human EA018. Therefore, neither analysis was attempted for Human EA018, due to the absence or obliteration of the necessary skeletal traits. The poor preservation of these human osteological materials also made paleopathological analyses difficult. However, extensive and often extreme signs of heavy, long-term biomechanical stress and load bearing were observed in what remained of Human EA018's skeletal system. Roughly 71% of a complete human skeleton, or 148 osteological elements and fragments, was identified (n = 148[157]), although the combination of whole bones and fragmentary remains in this count generates an overestimation of the completeness of this human skeleton.

[157]Complete, partial, and fragmentary human osteological remains were counted, which would generate an overestimated *H. sapiens* NISP if this analytical unit were in use for these analyses.

K.3.2 Skeletal sex assessment

Not possible, as osteological elements necessary for methods used in this study were not adequately preserved. However, the presence of a major pre-auricular sulcus on the right ilium suggests a skeletally female individual (Buikstra and Ubelaker, 1994; Mann et al., 2016), although a single skeletal trait should not be used to assess the skeletal sex of a given individual.

K.3.3 Age-at-death estimation

Not possible, as osteological elements necessary for methods used in this study were not adequately preserved.

K.3.4 Paleopathological indicators

K.3.4.1 Cranium

Much of the articulated cranial vault survived the taphonomic processes that disturbed Grave 015, although the osteological sites used for skeletal sex assessment and age-at-death estimation were absent or damaged postmortem. Postmortem damage in the form of long cracks mark what remains of the cranial vault. Two extrasutural bones appear at lambda, although postmortem damage makes this difficult to observe securely. On the endocranial surface of the right parietal and occipital, incursions mark the bone in proximity to the sagittal sulcus and cruciform eminence, respectively. What appears to be histological reaction of cortical bone marks the right superciliary arch (frontal), and both EAM (external auditory meati: left and right temporals). On the ectocranial surface of the occipital's left aspect three healing cuts or root etching marks appear.

Although no human teeth were identified among the mortuary assemblage recovered from Grave 015, left and right mandibular portions retain open alveoli. Thus, there is no direct evidence for antemortem tooth loss. Two inclusions mark the ectocranial surface of the mandibular incisors' alveoli. The etiology of these features is unclear. They present more anteriorly than commonly-observed enlarged mental foramina, and they could potentially result from postmortem damage to the mandible.

K.3.4.2 Vertebral column

Human EA018 manifests severe paleopathologies of the spinal column consist with heavy biomechanical work/load-bearing activities: DJD/arthritis and compressed vertebral bodies. The most compressed vertebral body belongs to L5, the final vertebra that articulates with the sacrum, and likely created both the asymmetrical cant of the lower spinal column and false joint between the right aspect of L5 and the right ala of the sacrum. Extensive signs of degenerative joint disease (DJD) appear throughout the osteological materials comprising the vertebral column of Human EA018, which occur from the upper neck (C1 to C2) through to the base of the spine (L5 to sacrum) and into articulations with the rib cage.

Major degenerative joint disease (DJD) marks the articular surface between the C1 and C2 vertebrae (on the dens and its C1 articular surface) in the form of bony deposits and microporosity. In all six of the cervical vertebrae recovered from Grave 015 evidence of DJD appears on the intervertebral articular surfaces (centra articular surfaces): microporosity, bony deposits on the centrum margins, and the wearing away of the anterior margin of these articular surfaces. Indicators of DJD continue throughout the remaining thoracic vertebrae. The centra articular surfaces of these thoracic vertebrae display wear, microporosity, and thickening of the rim/margin around these articular surfaces. Many of the costal facets on the transverse processes and lateral aspects of vertebral bodies show signs of DJD, including microporosity and bony deposits, where rib heads and tubercles articulate with the thoracic vertebrae, and also on the superior and inferior articular facets. Six of the indeterminate thoracic vertebrae additionally display exostoses/bony spurs around the inferior articular facets that are not mirrored in the articulating superior facets.

In all lumbar vertebra, indicators of DJD appear on all preserved centra articular surfaces (superior and inferior) in the form of microporosity, rimming of the margins around these surfaces, and occasional endplate lesions (perhaps Schmorl's nodes, although not necessarily fitting all morphological criteria: see Mann et al., 2016) into those articular surfaces. In particular, both indictors of DJD and other paleopathologies appear in the fifth lumbar vertebra and the sacrum. The superior and inferior centrum articular surfaces for L5 show extreme DJD, especially on the superior surface, with a major bony deposit/exostosis on the right aspect of one of these surfaces. A secondary articulation or "false joint" formed between the inferior aspect of the right portion of L5 and the right ala of the sacrum. This presentation may be classified as partial sacralization of the L5, which is not an uncommon nonmetric trait or anatomical variation (see Mann et al., 2016: 587, 592). However, when L5 and the sacrum are placed in anatomical position (and articulated), they deviate from the midline and are thus not truly symmetrical. Sacralization is a congenital anomaly of the vertebral column is often called Bertolotti's syndrome, and often accompanies lower back pain, heightened joint wear in vertebral articular facets in the L5, sacrum, and/or ilium, and scoliosis (Jain et al., 2013). However, from osteological materials along, it is difficult to assess the impact of L5 sacralization on the individual's life.

K.3.4.3 Thorax

Although the manubrium is only partially preserved, signs of extreme DJD are apparent on its left and right articular surfaces for the clavicles: microporosity and pitting on the articular surfaces, and exostoses/bony deposits around their margins. Despite postmortem damage to the sternum, microporosity is visible in the costal facets around which rimming has also occurred (DJD.).

The left and right first ribs both display microporosity and exostoses (bony deposits) on their heads and sternal ends, indicating an extreme stage of DJD. At least 12 ribs, both left and right, in addition to the first ribs display signs of DJD on the head and/or tubercle that includes microporosity, wear, and/or depression of these articular surfaces, and exostoses around their margins. A number of rib necks, both left and right, bear signs of healed but not properly set and stabilized fractures. The fragmentary and poorly-preserved nature of Human EA018's skeleton, including the ribs, renders a systematic account of trauma to the ribcage extremely challenging.

K.3.4.4 Upper limbs

The signs of extreme DJD observed in the left and right clavicles are consistent with paleopathologies observed in the left and right scapulae, and left and right first ribs. Microporosity, inclusions, and exostoses/bony deposits mark the uneven articular surfaces of the sternal and acromial ends of both clavicles.

The left and right scapulae from Grave 015 both manifest similar and unusual morphologies that may represent a combination of trauma, degenerative joint disease, and osteogenic/developmental anomaly. The acromion process of each scapula displays what looks like two new false joints with the acromial end of each clavicle in addition to the normal site of articulation. These two false joints present slightly differently on the left and right scapulae, respectively. While the development of false joints due to trauma may explain these morphologies, it is also possible that they are developmental anomalies in the ossification and development of the acromion process (*os acromiale*: Mann et al., 2006). The left and right scapulae further manifest superior borders that suggest either osteogenic/developmental anomaly or a representative of an extreme of normal morphological variation. The marked inferior angling of the scapular superior border moving laterally toward the glenoid fossa in both scapulae also appears in the scapulae of another human individual from Elst Ar. The glenoid fossa of each scapula exhibits marked depression and bony rimming around the margins of this articular surface for the humeral head, indicative of degenerative joint disease.

The unusual morphologies of the left and right scapulae along with the paleopathologies that mark the left and right clavicles may bear etiological relation to the left and right humeri (i.e., most mobile part of the shoulder girdle, where the upper limbs articulate with the thorax).

Signs of degenerative joint disease, especially microporosity, mark the head of the left and right humerii. Moving distally down each humerus, the greater and lesser tuberosities present more anteriorly than in standard human variation; their surfaces are lumpy and porous compared to standard humeral tuberosities. Major muscle groups attach to these tuberosities and insert in the bicipital groove between them; those muscles that insert on the portions that manifest unusual morphology include: teres major (lesser tuberosity); latissimus dorsi (bicipital groove); pectoralis major (greater tuberosity). A septal aperture marks the distal portion of the left humerus, a trait observed in another human from Elst Ar (Human EA08 in Grave 013; either Human EA14 or Human EA15 in Grave 021). Signs of degenerative joint disease appear on the distal articular surfaces of the left and right humeri: microporosity of the articular surfaces and rimming around those surfaces, with eburnation on the distal articular surface seen in the right humerus only.

Both the left and right ulnae exhibit signs of DJD on all proximal articular surfaces (i.e., at the elbow joint): microporosity and wearing down of the articular surfaces, uneven margins with exostoses/bony deposits around those surfaces, and an exostosis on the lunate surface (in the right ulna only). Less extreme but still apparent are signs of DJD in the distal articular surface of the left and right ulnae: some wearing down of those articular surfaces and rimming around them. Signs of DJD appear in both the left and right radii, although less markedly than in the ulnae. Some microporosity marks the radial head of both radii, and the margin around the distal articular surface has thickened in the left radius (distal right radius not present/preserved). One proximal phalange manifests signs of a poorly-healed fracture (i.e., not properly set to heal symmetrically). In the other remaining bones of the left and right hands, most of which were not recovered from/preserved in Grave 015, signs of DJD in the form of sharpened margins around articular surfaces are distributed throughout.

K.3.4.5 Pelvic girdle

What remains of the pelvic girdle is too fragmented and damaged to apply this study's methods for skeletal sex assessment and age-at-death estimation. The false joint with L5 discussed above is a major paleopathological feature on the right ala of the sacrum. This co-occurs with the centrum-to-centrum articulation of L5 and the sacrum as off-center, or canted away from the midline. A major pre-auricular sulcus, a trait often assessed as skeletally female (Buikstra and Ubelaker, 1994; Mann et al., 2016), appears on the right ilium. In both acetabula, signs of DJD manifest as worn-down articular surfaces with some microporosity, around which rimming has developed along with some exostoses/bony deposits. Histological reaction of cortical tissue appears in the non-articular surface of the right acetabulum, where the ligamentum teres inserts from the femoral head.

K.3.4.6 Lower limbs

Both the left and right femora display signs of DJD. In the proximal aspect of the left femur, microporosity marks the femoral head, and the fovea capitis is noticeably protruding. In the left femur's distal aspect (dorsal in particular), signs of major DJD appear as rimming of the articular surfaces marked with exostoses/bony deposits, with a rough exostosis on the lateral dorsal articular surface. On the medial aspect of the distal portion of the left femur, either postmortem damage or a healing cut appears in its articular surface. The distal portion of the right femur was not preserved. In the proximal portion of the right femur, the fovea capitis protrudes similarly to the presentation in the left femur, and signs of DJD appear on the articular surface of the femoral head. These include microporosity of the articular surface, worn down margins around that surface, and exostoses near the fovea capitis.

While the left patella was not recovered from Grave 015, the right patella displays the following signs of DJD: exostosis developed between the two articular surfaces, uneven rim or margin developed around those articular surfaces, and exostoses on that rim or margin. Conversely, the right tibia and fibula were not identified during bioarchaeological analyses of osteological remains from Grave 015. The left fibula is too degraded to assess for paleopathological indicators, whereas the left tibia shows minor signs of DJD in the proximal articular surface (margins around these surfaces that include some exostoses).

No bones from the right foot were identified during bioarchaeological analysis. The few bones from the left foot were, like the left fibula, largely too degraded to assess for paleopathological indicators. However, the left cuboid and navicular show some signs of DJD, with margins developed around their articular surfaces.

K.4 Nonhuman Animals in Grave 015

K.4.1 Overview

Just over 35% of the nonhuman animal osteological materials (total zooarchaeological n = 111) recovered from Grave 015 and stored in the ATRC/SHUTIS collections facility in Ulaanbaatar were identifiable to genus or taxon (*Bos* sp. and *Ovis/Capra*; combined n = 39). *Bos* sp. elements comprised 59% of those osteological materials (n = 23); *Ovis/Capra* comprised the remaining 41% (n = 16). The nonhuman osteological materials that comprised the remainder of the zooarchaeological assemblage from Grave 015 were identified as Large bovid (n = 54), Small bovid (n = 3), Large ungulate (n = 10), and Large/Medium animal (n = 4).

The small number of elements from Grave 015 identified as *Bos* sp. and *Ovis/Capra*, respectively, made it possible to estimate Minimum Number of Individuals (MNI: Lyman, 1994) for more than one element, then to cross-reference those estimates to generate a more refined MNI assessment. While this approach has the potential to factor age-at-death estimates and skeletal sex assessments into MNI calculation, MNI in general is prone to overestimating nonhuman animal MNI (see Lyman, 1994). Skeletal sex assessment of nonhuman animal osteological materials from Grave 015 was not possible. However, age-at-death estimates based on state of epiphyseal closure/fusion were possible for numerous *Bos* sp. and *Ovis/Capra* elements.

K.4.2 Age-at-death estimation and MNI by taxon

K.4.2.1 *Bos* sp. and Large bovid

A minimum of two *Bos* sp. individuals (or their component parts) were placed in Grave 015 based on the count of first and second phalanges. Nonmetric aging methods identified 11 subadult Large bovid osteological elements: two left and one right first ribs (head unfused or fusing); left scapula (superior border fusing); caudal and coccygeal vertebrae (cranial and caudal centrum plates unfused or fusing). However, these elements are osteologically subadult and could belong to the two *Bos* sp. individuals (*Bos* sp. MNI = 2) identified from first and second phalanges. *Bos taurus* first and second phalanges fuse between 18 and 24 months, and 15 and 18 months, respectively (see Appendix 3 in Grigson, 1982). The unfused and fusing osteological elements listed previously have long time periods over which they can fuse, providing no firm empirical basis for assigning these "subadult" *Bos* sp. and Large bovid elements to additional individuals beyond the two *Bos* sp. (MNI = 2). The two *Bos* sp. individuals are osteologically subadult but died at indeterminate calendrical ages.

K.4.2.2 *Ovis*/*Capra* and Small bovid

Although all of the osteological elements identified as *Ovis/Capra* indicate a single *Ovis/Capra* individual (MNI = 1), including a single second cervical vertebra (n = 1; C2, or axis), was interred in Grave 015. However, one of the Small bovid elements was identified as a subadult C2 (caudal centrum epiphyseal plate unfused and absent). Postmortem damage to this C2 interferes with genus/taxon identification, hence its assessment as Small bovid. Numerous possible taxa could comprise the Small bovid category in Central Mongolia, including domesticated sheep and goat. A single subadult *Ovis/Capra* element was identified in the zooarchaeological assemblage from Grave 015: a second phalange, which fuses at 12-18 months in sheep and goats (Zeder, 2006; but see Silver, 1969, where this element fuses at 13-16 months in sheep). Cross-referencing the *Ovis/Capra* and Small bovid osteological elements from Grave 015 indicates a minimum of two *Ovis/Capra* individuals (MNI = 2), one less than 12-18 months of age at death (the subadult *Ovis/Capra* second phalange and the subadult Small bovid C2) and the second older than 18 months at death (the adult C2).

K.4.3 Paleopathological indicators

Paleopathological indicators appear on only one nonhuman animal osteological element from Grave 015: an *Ovis/Capra* second phalange. Numerous exostoses or bony deposits appear on the medial, dorsal, and plantar surfaces of this second phalange.

K.4.4 Seasonality profile

The age-at-death estimations for the osteologically subadult *tavan khoshuu mal* elements discussed above did not provide sufficient empirical evidence from which to generate a seasonality profile for Grave 015.

K.4.5 Worked nonhuman animal bone

The 2012 Mongolian archaeological report on 2011 excavations at Elst Ar indicates in writing and imagery (Erdenebold et al., n.d.a) that worked nonhuman animal bone was found in Grave 015. The report describes a worked bone chopstick found in two pieces 10.1 cm and 8.3 cm in length, respectively. These two fragments were recovered along with a fragment of bronze mirror underneath human lower leg bones (themselves in anatomical position) within the inner stone cist within the outer wooden coffin at the base of the tomb, according to the report. Unfortunately, these two fragments of worked nonhuman animal bone were not available during laboratory analyses.

K.4.6 Discoloration and evidence of burning

Discoloration and other evidence of burning marks *Bos* sp. (n = 17), *Ovis/Capra* (n = 1), and Large bovid (n = 8) elements from Grave 015. All of the *Bos* sp. and Large bovid elements that show signs of burning were first and second phalanges; the discolored/burnt *Ovis/Capra* element is the axis (C2).

APPENDIX L

GRAVE 004

L.1 Overview of Grave 004

Grave 004 contained a minimum of two individuals: one human (MNI = 1) of female skeletal sex who died at 50+ years of age; and a small ungulate (MNI = 1).

L.2 Contextual Information on Grave 004 from The Mongolian Field Report

Contextual information for Grave 001 according to the 2012 field report (Erdenebold et al., n.d.a); what follows is my translation and light editing of said Mongolian-language field report for clarity:

Archaeologists from the Mongolian University of Science and Technology excavated Grave 004 in 2011. Grave 004 is located in the central section of the Xiongnu cemetery and has a circular stone surface feature with a diameter of 5 meters. At a depth of 240 cm, excavators encountered the lid of the coffin under flat capstones. Here they recovered human vertebral column and right ulna and radius[158]. The field analyst assessed the human individual as an older woman based on the ribcage[159]. At 270 cm, a human femur and ribs were encountered; at 290 cm, human tibia and fibula in anatomical position, cranium, and other bones were encountered in

[158]The report reads "human back and right ulna and radius, fragmented", without indication if all or just some of these elements are fragmented. Moreover, "human back" does not specify individual vertebra or provide a count.
[159]Methods for aging human ribs based on their sternal ends are used in forensic anthropology with some applications in bioarchaeology. Which of these methods the authors of the Mongolian 2012 field report (Erdenebold et al., n.d.a) used, or perhaps another approach, is unclear.

disarray/disorganized (implied disturbed from original positioning during burial). Excavators reached the bottom of the coffin at 310 cm; the coffin was 175 cm in length, 40 cm deep, 60 cm wide at the head, and 54 cm wide at the feet, and the wooden planks comprising it were 6 cm wide. On the right side[160] beyond the coffin's head was recovered the base of a ceramic vessel; near the right leg of the tomb's human occupant, excavators found a number of inorganic small finds. Included in written and photographed form in the report were two triangular fragments of green-colored turquoise (each no longer than 1cm at its longest edge; thought to be from some decoration or ornament) and part of a flat circular metal/iron object (approximately 10cm long and 7cm high; bronze and iron; very poorly preserved; sone face bears remains of cloth adhered to it). The report mentions further mentions the base of a ceramic vessel, a portion of a bronze mirror, and possibly a fragment of painted or stained coffin (wood); no photographs or further description of these finds appear in the report. The field report makes no mention of the nonhuman animal bone from Grave 004, but osteological laboratory analyses identified skeletal remains from at least one nonhuman animal (a small ungulate). The report further alludes to disturbances or reopenings of Grave 004, although not explicitly stated.

L.3 Humans in Grave 004

L.3.1 Overview of Human EA04

The human skeletal material from Grave 004 (approximately 50-75% of a complete human skeleton) comprises a skeletally-female individual who died over the age of 50: Human

[160]This was probably the actual right side, rather than the west side. See Appendix E (Grave 001) for notes on translating Mongolian directional and locational terms.

EA04. A total of 171 human osteological elements were recovered from Grave 004 at Elst Ar and identified during laboratory analysis, including an articulated cranium and the articulated left and right hemispheres of the mandible (*Homo sapiens* n = 171)[161]. It is important to note that the skeletal remains comprising Human EA04 were in good preservation condition at time of analysis and constituted roughly 50-75% of a complete human skeleton.

L.3.2 Skeletal sex assessment

Nonmetric traits in the pelvic girdle strongly indicate that Human EA04 was skeletally female, while nonmetric traits in the cranium suggest that Human EA04 was skeletally female. However, Human EA04's cranial morphologies – deformation of the cranium and the remodeling of the mandible (lower jaw) as a result of extensive antemortem tooth loss (both phenomena are discussed below) – cast doubt on the empirical surety of a skeletal sex assessment based on the cranium.

A left and a right innominate were identified during bioarchaeological analysis of the mortuary assemblage from Grave 004 at Elst Ar. Four traits or features of the pelvic girdle used to assess skeletal sex in standard bioarchaeological methodologies (Buikstra and Ubelaker, 1994) were preserved in both innominates: greater sciatic notch; ventral arc; subpubic concavity; and medial/ischiopubic ramus ridge. Scoring and averaging these traits yielded a skeletal sex assessment of definitely-to-probably female[162]. Moreover, the right ilium displays a preauricular

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[161]The articulated cranium and articulated cranium were each counted as a single osteological element, whereas all teeth (loose and in their alveoli) were counted as individual osteological elements. Osteological element count here does not differentiate between whole elements, partial elements, and fragments.

[162]1.625 out of 5, with a score of 1 as "definitely female" and a score of 5 as "definitely male", following the scoring systems developed by Buikstra and Ubelaker (1994) and Klales et al. (2012).

sulcus, which is a nonmetric trait often associated with female skeletal sex (Mann et al., 2016); the left ilium sustained postmortem damage to the region where a preauricular sulcus would be present. Five traits or features of the cranium used in standard bioarchaeological sex assessment methodologies (Buikstra and Ubelaker, 1994) were scored in the articulated cranium from Grave 004: nuchal crest; mastoid process; supraorbital margin; glabella; and mental eminence. Scoring and averaging these five traits yielded a skeletal sex assessment of probably female[163]. The gonial angle in the left and right hemispheres of the mandible was also measured, as the gonial angle is another nonmetric trait associated with skeletal sex. Human EA04 presents a 130° in the left and a 135° in the right, which are gonial angle measurements consistent with a male skeletal sex (Buikstra and Ubelaker, 1994). However, as noted previously, this mandible underwent remodeling due to extensive antemortem tooth loss; the reduction of and overall changes to the mandible are very likely to have impacted the presentation of the left and right gonial angles.

L.3.3 Age-at-death estimation

Age-at-death estimation based on the pelvic girdle used both the pubic symphysis and the auricular surface for Human EA04. Using age-at-death estimation methods in Buikstra and Ubelaker for the auricular surface (Lovejoy et al.) and public symphysis (Todd; Suchey-Brooks for females), the stage of Human EA04's pelvic girdle indicates an age at death of 50 years or older (1994). The degree of cranial suture closure and suture obliteration as indicators of age at seen in Human EA04's cranium suggest a slightly younger skeletal age. However, age-at-death estimates derived from analyses of the pelvic girdle are widely considered more accurate than

[163]Human EA04 presented a cranium sex assessment score of 2.1, where a score of 1 is definitely female and a score of 5 is definitely male, using standard bioarchaeological methodologies (Buikstra and Ubelaker, 1994).

those derived from the cranium. Most importantly, the age-at-death estimate for Human EA04 doesn't establish a cap or ceiling for age-at-death, meaning it is entirely possible that Human EA04 died at any age over 50 years and perhaps was significantly older when she died (Buikstra and Ubelaker; 1994). Advanced age would be consistent with the significant levels of occlusal wear, extensive antemortem tooth loss and resultant remodeling of Human EA04's mandible, and paleopathological indicators in the vertebral column.

L.3.4 Paleopathological indicators

Below a descriptive account of paleopathologies observable in the osteological materials constituting Human EA04 begins with the cranium and proceeds distally through the axial skeleton and on into the appendicular skeleton, finishing with the lower limbs. Overall Human EA04 manifests signs of degenerative joint disease (DJD) and histological reaction (a generalized response of living osteological tissue that often indicates microbial infection) in certain aspects of the skeletal system (including the cranium, vertebral column, upper thorax, elbows, hands, and feet), unusual cranial morphology, numerous dental pathologies (including extensive antemortem tooth loss, build-up of dental calculus, and heavy occlusal wear on anterior teeth), and significant remodeling of the lower jaw. Significant antemortem tooth loss manifested in a few open tooth sockets (i.e., alveoli) and numerous resorbed empty tooth sockets in the upper and lower jaw of Human EA04. Heavy plaque built up in the remaining premolars and molars in Human EA04's lower jaw (mandible), and the remaining anterior teeth exhibited heavy occlusal wear. Taken together, these pathologies indicate that Human EA04 suffered from poor dental health for a significant period of time prior to death.

L.3.4.1 Cranium

Overall the entire cranium of Human EA04 is somewhat asymmetrical, best observed from the inferior aspect with a midline through the foramen magnum, where the cranium's overall displacement to the right appears most clearly. Viewing the cranium from the anterior aspect – facial view – the cranial vault leans to the left in the superior aspect while the right maxilla is displaced/leans to the right. The cranial vault is depressed at the left frontal extending to the anterior aspect of the left parietal. A groove marks the ectocranial surface of the right greater wing of the sphenoid, and also appears somewhat on the left greater wing (i.e., somewhat bilateral). The asymmetries and unusual morphologies in Human EA04's cranium could be artificial cranial modification or congenital; further detailed analysis is required.

Histological reactions occur in the cranium at glabella (bilaterally), at both left and right external auditory meati (slight reaction), and the empty alveolus for LM^3.

The maxillae and mandible exhibit extensive antemortem tooth loss and resorption of the alveoli. Few teeth remained in the left and right maxillae at the time of Human EA04's death. RI^1, RP^3-RM^3, and LP^3-LM^3 were lost antemortem; the only alveolus for these teeth lost antemortem that did not resorb before Human EA04's death was LM^3. Thus, in Human EA04's left maxilla, only the canine, lateral incisor, and central incisor remain; in the right maxilla, only the lateral incisor and canine remain. Little to no observable plaque appeared on the remaining maxillary teeth, and no caries were observed. However, the maxillary right canine, left central incisor, and left lateral incisor display extreme occlusal wear, creating a trough-like inclusion in the occlusal surface (with the higher edges of the trough at the anterior/labial and posterior/lingual aspects).

In Human EA04's left mandible, only the first molar, third premolar, canine, and lateral incisor remain; in the right hemisphere, only the central incisor and first molar remain. However, unlike in the maxillae, alveolar resorption in Human EA04's mandible was more limited. Only the alveoli for the left and right second and third molars, the left canine, and the right second premolar (RP_4) were fully resorbed when Human EA04 died.

The two remaining mandibular incisors and right canine are heavily worn on their occlusal surfaces. One loose tooth – a heavily-worn, single-rooted permanent tooth – was also associated with Human EA04; heavy occlusal wear poses a challenge to identification, but this tooth appears to be a lower canine or incisor. Plaque has built up on the occlusal surface of the remaining molars and premolars; plaque has also accumulated on the crowns and exposed roots at the buccal aspect of LM_1 and anterior aspect of LP_3.

The mandible underwent significant remodeling as a result of alveolar resorption where the lower left and right second and third molars were lost. The mandibular corpi were reduced, the mandibular rami narrowed, and the resulting angle between the coronoid process and the mandibular condyle was widened bilaterally.

L.3.4.2 Vertebral column

C1 exhibits DJD on the articular surface for the dens (of C2) and non-articular area around the vertebral canal. Some porosity indicative of DJD marks the articular surfaces of the centra in two of the other cervical vertebrae. The demifacets (for articulation with rib tubercles) of several thoracic vertebrae are enlarged and marked with porosity, which suggest trauma or disease. In the lumber vertebrae, major DJD in the form of porosity and bony deposits along the anterior margins of the centra articular surfaces appears on the superior and inferior articular surfaces of the centra, which increases in severity moving distally (i.e., toward the sacrum). The vertebral bodies of the lumbar vertebrae are generally compressed. The right (lateral) aspect of L5 includes an extraneous bony deposit, which should impact the sacrum; however, the right superior aspect of the sacrum was damaged/broken by time of analysis. What remains of the sacrum bears no evidence of paleopathology.

L.3.4.3 Thorax

No clear evidence of antemortem fractures appear in the ribs. However, DJD (in the form of porosity and bony deposits on and around articular surfaces) appears on numerous rib heads and tubercles. These DJD indicators imply disease and/or trauma. Both the left and right scapulae should porosity (DJD) at the articular site for the left and right clavicles (i.e., on the acromion processes), respectively; however, neither scapula displays DJD or significant wear on either glenoid fossa (i.e., articular site for each humeral head). Both the left and right clavicle exhibit DJD on their articular surfaces for the scapula (i.e., acromion process). That DJD – as porosity – extends to the non-articular inferior aspect of each lateral clavicle; this could indicate infection rather than true DJD porosity. The manubrium bears evidence consistent with the DJD (indicative of heavy workload and/or infection) seen in the clavicles and scapulae: an irregular inclusion (hole) appears on the posterior aspect of the left and right articular surfaces for the clavicle heads. At the sites of articulation for the left and right first ribs on the manubrium, the articular surfaces are marked with some porosity, bony deposits around the margins of the articular surface, and on the right articular surface for the right first rib a bony spicule (likely ossified cartilage) has developed.

L.3.4.4 Upper limbs

Although both left and right humeri were recovered from Grave 004, the humeral heads of both were damaged postmortem to the extent of absence. The deltoid tuberosity on the left and the right humerus, respectively, is very well developed. In the distal aspect of both humeri, some lipping occurs around the margins of each trochlea and microporosity marks the posterior aspect of each distal articular surface. In both the left and right ulnae, a bony deposit appears between the superior and inferior articular facets for the trochlea (humerus), or in the center of the ulnar lunate surface. No paleopathological indicators appear in either the left or right radius. Some carpal bones from both the left and right hands manifest indicators of DJD or infection. Both the left and right lunates show DJD, and the right capitate and left triquetral show porosity or possible histological reaction.

L.3.4.5 Pelvic girdle

The right aspect of the superior portion of the sacrum (right ala), near the site of articulation with L5 and thus the vertebral column, was damaged postmortem. What remains of the sacrum shows no signs of paleopathology. Both os coxae are present and largely complete. In the left os coxa, the acetabulum manifests histological reaction in its non-articular surface; lipping occurs at the margins of the lunate surface of the left and the right acetabula.

L.3.4.6 Lower limbs

No indicators of paleopathology appear in the leg bones: left and right femora, left and right tibiae, and left and right fibulae. However, the proximal and distal aspects of both fibulae were damaged postmortem, making assessment of the fibular articular surfaces impossible. All of the tarsals and metatarsals from Human EA04's left foot were recovered, whereas from Human EA04's right foot all the metatarsals and all of tarsals except the right calcaneus and right cuboid were recovered. Only eight pedal phalanges were associated with Human EA04 when retrieved from collections storage in Ulaanbaatar. In these bones of the feet, microporosity and/or histological reaction appear on the right 1st metatarsal (RMT1), left 5th metatarsal (LMT5), and right 1st cuneiform.

L.4 Nonhuman Animals in Grave 004

Only two nonhuman animal osteological remains from Grave 004 were identified during laboratory analysis at the archaeological collections facility (then called the Ancient Technologies Research Center: ATRC) at the Mongolian University of Science & Technology (MUST/SHUTIS) in Ulaanbaatar. They appear to be rib fragments, possibly from a small ungulate ('Small ungulate' as a zooarchaeological category can encompass but is not limited to *Ovis aries*, *Capra hircus*, and *Ovis/Capra*). However, their fragmentary nature and morphological presentation challenge identification of their element and taxon. The cortical surface of both fragments appears entirely covered in either woven bone or extreme histological reaction. One possibility is that both fragments are ossified rib cartilage from a nonhuman animal in the medium-sized dog to medium-sized sheep/goat body size category (see Opovo zooarchaeological coding system by Nerissa Russell: Russell, n.d). Given these uncertainties, little can be said with confidence about the nonhuman animal component of Grave 004. It was not possible to generate a seasonality profile for Grave 004 based on zooarchaeological data from these materials.