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Siberian Odyssey

Kelly E. Graf

ABSTRACT
Human dispersal to the Americas was a complex process. Both place of origin and timing of this event are hotly debated. Based on genetics, geography, language, and cultural similarities, most researchers consider Siberia the homeland of the First Americans with migration via the Bering Land Bridge. Others, however, argue earliest colonizers originated in Western Europe, arriving via a trans-oceanic voyage. Some hold that this early colonization event took place before the Last Glacial Maximum (LGM), while others contend it happened much more recently during the Late Glacial. In this chapter, I review Siberian Upper Paleolithic archaeology. The Siberian record indicates two pulses of modern humans into far northeast Asia during the late Pleistocene, one before and one after the LGM. The colonization of Siberia by modern humans was an episodic process, taking over 10,000 years, setting the stage for the initial peopling of the Americas.

KEYWORDS: Siberia, Upper Paleolithic, LGM

Introduction

Archaeologists have long looked to Siberia as the homeland of the First Americans. Despite resistance from some archaeologists (see Collins et al. this volume; Bradley and Stanford 2004; Stanford and Bradley 2012), mounting evidence mostly from molecular geneticists investigating DNA from both ancient skeletons and living populations has very convincingly illustrated that all founding lineages and sub-lineages of First Americans originated in greater Northeast Asia and came to the Americas via a single migration (de Saint Pierre et al. 2012; Derenko et al. 2001; Fagundes et al. 2008; Fu et al. 2013; Gilbert et al. 2008; Kashani et al. 2013; Kemp et al. 2007; Kitchen et al. 2008; Mulligan and Kitchen, this volume; O'Rourke and Raff 2010; Tamm et al. 2007). Clearly if we are to understand where First Americans came from, then DNA studies are the definitive way to do this because try as we may, we cannot make silent stones and bones speak about their makers' origins.

Because Siberia is likely the Pleistocene homeland of Native Americans, I want to turn attention to the archaeological record of this vast region of Northeast Asia to look at the behaviors that conditioned the timing and process of dispersal to Beringia and the New World.

The Siberian Upper Paleolithic record is traditionally divided into three phases: early, middle, and late Upper Paleolithic (Vasil'ev 1992). These phases are based on typological and chronological distinctions. The record is characterized by peaks and nadirs of dated cultural layers (or occupations). When compared with global climate records, high points in occupation numbers tend to align with warm intervals, while lows in occupation numbers tend to correspond with cold intervals during the second half of the late Pleistocene (Graf 2005). In the sections that follow, I provide a broad overview of the archaeological record of modern humans in Siberia during the late Pleistocene and follow up with a discussion of how this record can inform on dispersals north and to the Americas.

Early Upper Paleolithic

Anatomically modern *Homo sapiens* were not the first people to inhabit southern Siberia, evidenced by archaeological and skeletal remains of Neanderthals and Denisovans at Denisova and Okladnikov Caves in southwestern Siberia (Derevianko

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2010; Green et al. 2010; Krause et al. 2007; Reich et al. 2010; Turner 1990). These occupations probably happened before 50,000 years ago, presumably during the last interglacial/early glacial or marine isotope stages (MIS) 5–4 (Goebel 1993, 1999, 2002b; Derevianko et al. 1998), so their ages cannot be established using radiocarbon (^{14}C) dating. A series of radio-thermoluminescence or RTL dates obtained on site sediments indicates the Middle Paleolithic layers date to late Middle Pleistocene times or before about 128,000 years ago (Derevianko et al. 1998, 2003).

Despite not being the "first" to Siberia, early modern humans were certainly the first to disperse north and east into sub-arctic and eventually arctic Siberia, Beringia, and ultimately the New World (Goebel 1993, 1999; Mulligan and Kitchen this volume; Neves et al. this volume; Pitulko et al. this volume; Potter et al. this volume). Earliest modern humans were certainly capable of inhabiting a wide array of habitats because as early as about 47,000–40,000 years ago their cultural remains were distributed from sites in Southwest Asia (Bar-Yosef 2000; Kuhn 2002; Marks 1990) north and east to sites such as Kostenki and Kara Bom found in cold, dry environments of Eastern Europe and southern Siberia, respectively (Anikovich et al. 2007; Goebel et al. 1993). By about 38,000 years ago modern humans expanded as far north as the Arctic Circle (~66° N) as evidenced by a handful of lithic artifacts and faunal remains at Mamontovaya Kurya in the western foothills of the Ural Mountains of European Russia (Pavlov et al. 2001, 2004) and eventually arctic Northeast Asia, where thousands of lithic and osseous cultural materials were found at Yana RHS (71° N) in northwestern Beringia (Pitulko et al. 2004, this volume). The initial pulse into northern environments is recognized, not by skeletal remains, but by the durable artifacts left behind. Below, I explore the geographical and temporal framework of the early Upper Paleolitihc (EUP) and then review the archaeological record of these sites in Siberia.

EUP Distribution and Chronology

Hundreds of Paleolithic sites dot the Siberian landscape; however, EUP sites have been found sparsely distributed across just the territory south of 55° N from the upper Ob' River in the west to Transbaikal in the east (Figure 4.1). Localities with EUP occupations are not numerous, and many of these have contextual problems. Though at least 25 EUP sites are reported, only 8 of these were found in secure contexts with meaningful data to review, and therefore provide the corpus of data on the EUP archaeological record. In this chapter, ^{14}C dates were calibrated using the IntCal09 curve (Reimer et al. 2009) in Calib 6.0 ^{14}C calibration program.

In the northern foothills of the Altai Mountains near the headwaters of the Ob' River in southwestern Siberia, EUP artifacts were discovered at seven sites. Four sites, Anui-1, Anui-3, Ust' Karakol, and Kara Bom, were found in open-air contexts on terrace-like surfaces mantled by colluvium and overlooking the Anui and Ursul rivers (Derevianko et al. 1998; Goebel et al. 1993). The other three sites, Denisova, Ust' Kanskaia, and Maloialomanskaia caves, overlook the Anui, Charysh, and Katun' river drainages, respectively. Of these, Ust' Karakol and Kara Bom represent the initial pulse of modern humans into this region with their clean EUP assemblages and relatively reliable ^{14}C dates (Derevianko et al. 1998, 2003; Goebel 2002b, 2004a; Goebel et al. 1993).

Kara Bom contains at least four discrete EUP cultural layers (2a–2d) within a single geological stratum (4) following Goebel et al. (1993) or from two geological strata (6–5) following Derevianko and Rybin (2005). Wood charcoal from these layers has produced eight ^{14}C dates, placing EUP occupations between about 43,300 ± 1600 (GX-17596) and 30,990 ± 460 (GX-17594) ^{14}C years before present (yr BP) or about 49,740–34,770 calendar (cal) yr BP, with the lower two occupation horizons dated to 49,700–44,300 cal yr BP and the subsequent horizons 40,800–34,600 cal yr BP. Ust' Karakol contains a single EUP cultural component found in four geological strata (11–8). Seven wood charcoal samples from three hearth features give an age range of 35,100 ± 2850 (SOAN-3259) to 29,720 ± 360 (SOAN-3359)^{14}C (44,600–33,400 cal) yr BP for the component. The other five sites come from dubious contexts where either their small, yet diagnostic, assemblages have no associated chronometric dates (e.g., Anui-1) or from EUP artifacts found with Middle Paleolithic artifacts in stratigraphically mixed contexts in colluvial or cave deposits (e.g., Anui-3, Denisova, Ust' Kanskaia, and Maloialomanskaia Caves) (Derevianko and Markin 1990; Derevianko et al. 1990, 1998; Goebel 1993, Goebel 2002b, 2004a; Tseitlin 1979).

Several EUP sites were discovered in the northern foothills of the Saian Mountains and Lena-Angara Plateau in the upper reaches of the Enisei, Angara, and Lena rivers in south-central Siberia. All archaeological sites found from the Enisei River east to Lake Baikal are discussed together below. In this region sites were discovered in open-air settings on fluvial terraces mantled by a combination of colluvial and eolian deposits. The best evidence of EUP was found at Malaia Syia and Makarovo-4 (Abramova et al. 1991; Drozdov et al. 1990: Goebel 2002b, 2004a; Larichev et al. 1988; Muratov et al. 1982). There are several more that could represent EUP occupations such as Ust' Maltat-2, Sosnovyi Bor, Arembovskii, and Voennyi Gospital; however, these sites come either from geological contexts that lack datable materials or from artifacts found in surface contexts that cannot be reliably associated with dates from nearby profiles (Akimova et al. 2010a, 2010b; Goebel 1993, 2002a, 2004a; Medvedev 1983; Medvedev et al. 1990; Muratov et al. 1982, Semin et al. 1990; Tseitlin 1979).

Malaia Syia is an open-air site that contains a 3-m-thick profile of loess with 5 stratigraphic layers and a single cultural layer containing an EUP artifact assemblage found in the paleosol of stratum 4 (about 2.5 m below the surface) (Muratov et al. 1982). Four dates are reported from this paleosol, three on bone samples from the faunal assemblage and one on a "grab-sample" of charcoal from the paleosol. Two bone dates of 34,500 ± 450 (SOAN-1286) and 34,420 ± 360 (SOAN-1287) ^{14}C yr BP place the age of the EUP component within the range of 40,800–38,600 cal yr BP. The other two dates are

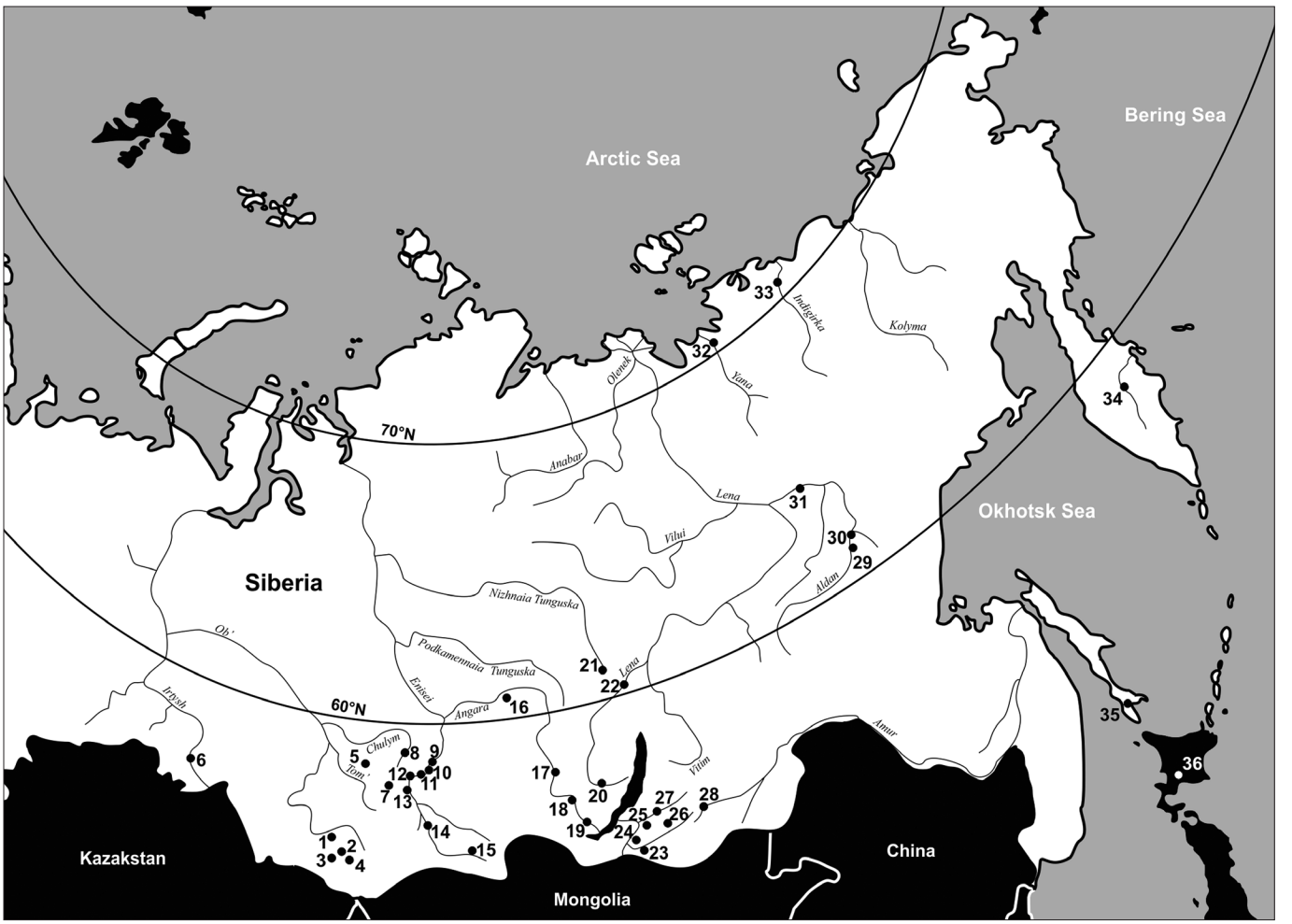

Figure 4.1 Map of Northern Asia with locations of Paleolithic sites discussed in text: **1**, Anui, Ust' Karakol, Denisova Cave; **2**, Kara Bom; **3**, Ust' Kanskaia Cave; **4**, Maloialomanskaia Cave; **5**, Shestakovo; **6**, Chernoozer'e; **7**, Malaia Syia; **8**, Achinsk; **9**, Afontova Gora; **10**, Ust' Maltat, Derbina, Listvenka; **11**, Kurtak, Kashtanka; **12**, Novoselovo, Kokorevo; **13**, Sabanikha, Tashtyk; **14**, Ui, Maina; **15**, Golubaia, Nizhnii Idzhir'; **16**, Ust' Kova; **17**, Igeteiskii Log; **18**, Mal'ta, Buret', Sosnovyi Bor; **19**, Arembovskii, Voennyi Gospital; **20**, Makarovo; **21**, Nepa; **22**, Alekseevsk; **23**, Studenoe, Ust' Menza, Priiskovoe, Chitkan, Kosaia Shivera; **24**, Kunalei, Podzvonka; **25**, Varvarina Gora, Kamenka; **26**, Tolbaga, Masterov Kliuch, Masterov Gora; **27**, Khotyk, Sannyi Mys, Sapun; **28**, Sokhatina; **29**, Diuktai Cave; **30**, Ust' Mil', Verkhne Troitskaia; **31**, Ikhine; **32**, Yana; **33**, Berelekh; **34**, Ushki Lake; **35**, Ogon'ki; **36**, Kashiwadai.

aberrantly too young (Goebel 1993; Lisitsyn 2000; Muratov et al. 1982). Makarovo-4 is another open-air site that consists of a 4-m-thick profile of colluvial and aeolian deposits with four stratigraphic layers and a single EUP cultural layer. Sand-blasted artifacts were found about 2 m below the surface lying atop a sandy scree, wind-deflated lag deposit, underlying stratum 2 and capping stratum 3. The cultural layer with overlying and underlying sediment was penetrated by a network of ice-wedge pseudomorphs beginning in stratum 2 and extending down through stratum 3 (Aksenov 1989). Despite these post-depositional site-formation problems, the EUP assemblage appears intact as a component, and three infinite AMS dates all $>$39,000 (AA-8880, AA-8878, AA-8879)^{14}C yr BP on three bone samples found in situ during excavations indicate an age $>$45,000 cal yr BP (Goebel and Aksenov 1995).

Similar to the Altai region, most proposed EUP site occupations in south-central Siberia come from problematic contexts. At the Ust' Maltat-2 site, which is being actively eroded by the Krasnoiarsk Reservoir, EUP artifacts were found eroding from a redeposited stratigraphic setting and not directly dated (Akimova et al. 2010b). Arembovskii, and Sosnovyi Bor produced characteristic EUP assemblages but remain undated (Goebel 1993, 2004a; Medvedev 1983). Voennyi Gospital was first excavated in 1871, and the original EUP assemblage was subsequently lost to a fire in 1879. Renewed excavations in the 1980s produced a small, unexpressive assemblage with a ^{14}C date on horse bone of 29,700 $\pm$ 500 (GIN-4440) ^{14}C (35,200–33,100 cal) yr BP, which may or may not date the original EUP occupation (Goebel 2004a; Medvedev et al. 1990).

In the Transbaikal in southeastern Siberia, several EUP sites have been reported in open-air settings on alluvial terrace landforms mantled by a combination of colluvial and eolian deposits. Three of these sites contain EUP cultural occupations that were found in reasonably reliable stratigraphic situations, including Varvarina Gora, Masterov Kliuch', and Kamenka (Bazarov et al. 1982; Goebel 2004a; Goebel and Aksenov 1995; Goebel et al. 2000a; Lbova 1996, 2000, 2005; Okladnikov and Kirillov 1980). Varvarina Gora is an open-air

site that contains a 2.5-m-thick profile of colluvial and eolian deposits with four strata and a single cultural layer containing an EUP artifact assemblage found in stratum 3 (about 1.5 m below the surface) (Goebel 2004a; Okladnikov and Kirillov 1980). Three conventional ^{14}C dates on bones from the faunal assemblage suggest an age range of 34,900 ± 780 (SOAN-1524) to 29,895 ± 1790 (SOAN-3054) ^{14}C (41,600–31,100 cal) yr BP (Bazarov et al. 1982; Lbova 2005), but two AMS bone dates were infinite (> 34,050 [AA-8875] and > 35,300 [AA-8893] ^{14}C or > 38,500 cal yr BP) (Goebel and Aksenov 1995). The infinite AMS dates, plus the probability that the conventional bone dates are too young, suggests an age of > 38,500 cal BP for the cultural layer. Masterov Kliuch' is situated in 160-cm-thick colluvial deposits with six stratigraphic units and two EUP cultural layers. Detailed geoarchaeological work found the lower EUP layer in a primary depositional context, but the upper component was not. Two AMS bone dates from the faunal assemblage associated with the lower component produced dates of 32,510 ± 1440 (AA-23640) ^{14}C and 29,860 ± 1000 (AA-23641) ^{14}C yr BP, indicating an age range of 40,700–32,000 cal yr BP (Goebel et al. 2000a). Kamenka was found in a 12-m-thick set of colluvial deposits in which an EUP cultural component, complex A/C, was found underlying a middle Upper Paleolithic (MUP) complex B. Six conventional ^{14}C dates on bones were reported for complex A/C (Lbova 2005). Four indicate an age range of 35,845 ± 695 (SOAN-2904) to 30,220 ± 270 (SOAN-3354) ^{14}C yr BP or about 42,000–34,500 cal yr BP. The other two dates seem aberrant with one far older than the rest (40,500 ± 3800 [AA-26743] ^{14}C yr BP and the other (26,760 ± 265 [SOAN-3353] ^{14}C yr BP) far too young, especially since it is statistically the same age as the dates from overlying complex B.

Several other sites in the Transbaikal hint at EUP occupation, but they were found in problematic contexts. Sannyi Mys, Masterov Gora, Sapun, and Sokhatino have EUP assemblages that remain undated (Aseev and Kholiushkin 1985; Goebel 1993; Kirillov and Kasparov 1990; Okladnikov 1971; Okladnikov and Kirillov 1980), while both Podzvanka and Khotyk each have Middle and Upper Paleolithic artifacts found in the same colluvial stratum, suggesting mixed stratigraphic contexts (Buvit et al. 2011; Lbova 2000, 2005; Tashak 2000, 2002). Another problem is Tolbaga. This site contains a massive EUP component also found in colluvial sediments. All artifacts and bones were oriented downslope so it is fairly clear that the archaeological materials are secondarily deposited. The five ^{14}C bone dates (three conventional and two AMS) span 34,860 ± 2100 (SOAN-1522) to 25,200 (AA-8874) ^{14}C (43,000–29,500 cal) yr BP (Bazarov et al. 1982; Goebel and Waters 2001; Orlova 1998). The very long time range reflected by the dates may mean the component consists of a mixture of EUP and later MUP artifacts.

EUP Technologies

EUP lithic assemblages are blade-based and flake-based technologies. Raw-material procurement and selection focused on use of fine-grained, high-quality stones such as argillite, chert, quartzite, and, to a lesser extent, basalt. Most raw materials were local stones found close to the sites in nearby stream alluvium (Goebel 2004a). Primary reduction strategies focused on production of blades as tool blanks. Blade cores were large, and either parallel (flat-faced) or sub-prismatic in character. Blade removal proceeded in either a unidirectional or bidirectional fashion so that cores either possessed a single striking platform or two platforms, respectively. Typically, a EUP core began its use life as a large parallel core, depending on the size of the original cobble. Through reduction, multiple sides (or fronts) of the core would be used, and eventually the core would take on a sub-prismatic shape. On occasion, more informal flake cores were used (Goebel 1993, 2004a). Secondary-reduction activities largely centered on manufacturing tools on elongated blades. Tool retouch was primarily unifacial with resharpening flakes removed from dorsal surfaces of the tool blank. Burination occurred in nearly all assemblages with production of angle burins on snaps. Bifacial reduction occurred in nearly every EUP assemblage; however, bifaces are present in low frequencies in individual assemblages. Typical EUP tool types include unifacial points, retouched blades, side scrapers, end scrapers, bifaces, notches, denticulates, gravers, burins and wedges (Goebel 1993, 2002b, 2004b).

EUP assemblages contain osseous artifacts that include both utilitarian and nonutilitarian pieces. Nearly every EUP cultural occupation has an inventory of non-lithic tools. These items include small antler points, awls and needles made on bones, and ivory and bone retouching implements. By contrast, nonutilitarian pieces are rare in EUP assemblages, appearing in very low numbers (typically fewer than five) in the assemblages from Kara Bom, Voennyi Gospital, Kamenka, and Tolbaga (Derevianko and Rybin 2005; Goebel 2004a; Lbova 2000; Vasil'ev et al. 1987). Mostly these pieces consist of bone beads, bone-bead preforms (or cylindrical beads), and bone and teeth pendants. Furthermore, a single polished-stone pendant was found at each of the sites of Varvarina Gora and Ust' Karakol (Derevianko and Rybin 2005). Osseous and stone jewelry pieces were also found in mixed levels at the sites of Denisova Cave, Maloialomanskaia Cave, Ust' Kanskaia Cave, Podzvonka, and Khotyk (Derevianko and Rybin 2005; Derevianko et al. 2008; Lbova 2000; Tashak 2000, 2002) and likely belong with the EUP components of these sites.

EUP Fauna

Generally, Siberian Paleolithic faunal assemblages are few, and typically only presence or absence of data is available in the literature. This is certainly the case for the EUP. Of the sites discussed above, fauna from only half or 12 sites is reported (Vasil'ev 2003a). Most assemblages provide a long list of fauna representing a wide range of habitats such as forest, forest-steppe, and tundra. Typical taxa include bison, yak, woolly rhinoceros, horse, wild ass, red deer, roe deer, reindeer, Argali sheep, Mongolian gazelle, Kiakhta antelope, Siberian mountain goat, bear, wolf, fox, hare, and ground

squirrel and other rodents. Incidentally, data on number of identified specimens (NISP) and minimum number of individuals (MNI) are available from five sites (Malaia Syia, Tolbaga, Varvarina Gora, Kamenka, and Podzvonka) (Germonpré and Lbova 1996; Ovodov 1987; Vasil'ev et al. 1987; Vasil'ev 2003a). Numbers from these assemblages demonstrate no preference for the different taxa procured. From these data it appears that in Siberia early modern humans were procuring animals when they encountered them and did not use a systematic hunting strategy (Goebel 2004a).

EUP Features

Hearth features were found at the sites of Kara Bom, Ust' Karakol, Makarovo-4, Varvarina Gora, Tolbaga, Kamenka, and Sannyi Mys. Those features found at Kara Bom, Ust' Karakol and Makarovo-4 were unprepared, but consisted of discrete concentrations of ash, charcoal, charred sediment, and bone and lithic debris (Aksenov 1989; Derevianko et al. 2003; Goebel et al. 1993), whereas sites in the Transbaikal had stone-lined hearths (Konstantinov 1994; Lbvoa 2000; Okladnikov 1971). Storage pits were found at Varvarina Gora, Tolbaga, Kamenka, and Sannyi Mys. Dwellings were identified by oval-to-circular distributions of large cobbles, boulders, and stone slabs encompassing storage pits and central hearth features (Konstantinov 1994; Lbova 1992, 1996, 2000, 2005; Okladnikv 1971; Okladnikov and Kirillov 1980). An additional dwelling was reportedly found at Malaia Syia; however, no details were ever published (Vasil'ev 2003b).

EUP Summary

EUP sites, representing the initial pulse of modern humans into Siberia, are distributed from the Ob' River to the Transbaikal and as far north as the uppermost reaches of the Lena River immediately west of Lake Baikal. Dating of EUP sites has been highly problematic since most are situated in complicated colluvial-depositional settings so there is a good chance of mixture of multiple archaeological components. Additionally, most dates from these sites were obtained on bones by conventional ^{14}C methods. Because conventionally dated samples were not properly pretreated so bone apatite was dated and some of these were likely pooled samples, they should not be trusted unless they provide ages statistically the same as AMS dates on bone collagen. Sites with clean archaeological assemblages, found in understandable stratigraphic contexts, and associated with chronometric dates suggest modern humans were first in the Altai foothills region, and perhaps south-central Siberia, by about 50,000 cal yr BP. Certainly they were to Makarovo-4 before 45,000 years ago and possibly to the Transbaikal as early as 42,000–41,000 years ago. Available chronological data indicate that the EUP may have lasted until about 33,000 years ago; however, the younger ages are somewhat suspect owing to their potential contamination by recent or modern carbon. Overall, EUP sites date to the middle part of MIS-3, climatically a period of global warmth. Though the age ranges for several sites are quite large, encompassing both cold and warm intervals of MIS-3, sites with tighter dates seem to group into two periods. For instance, Kara Bom, Makarovo-4, and perhaps Varvarina Gora date to an early warm interval prior to the early stade of MIS-3 (50,000–45,000 years ago), while others such as Masterov Kliuch' and Tolbaga seem to date to the warm Malokheta interstade (40,000–35,000 years ago).

The archaeological record suggests these initial settlers were making sophisticated blade-based technologies. Projectiles were tipped with unifacial stone points, a variety of food-processing and clothing-manufacturing implements are reflected in the lithic and osseous industries, and presence of nonutilitarian objects at many sites indicates people were adorning themselves with jewelry items. Interestingly, the use of personal ornaments is known from across the EUP world; however, the presence of needles is known only to the northern contexts of Siberia and Eastern Europe, perhaps reflecting the need for manufacturing warm clothing in these northern environments (Hoffecker 2005). Substantial dwellings, storage pits, and highly varied faunal assemblages indicate people were living at these sites for relatively long periods of time, perhaps on a seasonal basis.

Middle Upper Paleolithic

Across western Eurasia, Upper Paleolithic sites dating between 30,000 and 20,000 ^{14}C (~34,000–24,000 cal) yr BP and containing elaborate burials, Venus figurines, and small bladelet tools are termed Gravettian (Roebroeks et al. 2000). In Siberia this phase is commonly called the MUP (Vasil'ev 1992, 2000). Many archaeologists have referred to MUP or groups of MUP sites as the Mal'ta Complex or Mal'ta Culture, named for the famous Mal'ta site (Derevianko 1998; Lisitsyn 2000; Okladnikov 1968). Siberian MUP sites are typically distributed wider than before, there are many more, and their assemblages are known for bladelet production, Venus figurines and other art, and impressive dwelling features.

MUP Distribution and Chronology

MUP sites have the same basic west-east distribution as the EUP. In fact, a few of the sites discussed above also contain later MUP occupation layers (e.g., Ust' Karakol, Malaia Syia, and Kamenka). As with the EUP, most are located south of 55° N; however, a handful (e.g., Nepa-1, Alekseevsk, Ust' Kova, Igeteiskii Log, Achinsk, Kurtak-4, Kurtak-5, Kashtanka-1, and Novoselovo-13) were found farther north, between 55° N and 60° N, a range extending more than 500 km north of that of the EUP. Additionally, the Yana RHS site (Yana), was found another 1200 km north at ~71° N along the lower Yana River, only 150 km upstream from where the river flows into the Arctic Ocean (Pitulko et al. 2004, this volume). Unlike the record for the EUP, there are several dozen reliable MUP cultural occupations reported for Siberia. Since I am limited for space and there are so many more post-dating the EUP, the rest of my review will highlight not all, but only key sites from MUP and late Upper Paleolithic (LUP) contexts.

At least three MUP sites have occupation layers that date from about 30,000–26,000 ^{14}C (35,000–30,500 cal) yr BP, dur-

ing the warm Lipovo-Novoselovo interstade. At Yana three spatially discrete localities with MUP archaeological remains were found and are called Yana B, Northern Point, and TUMS 1. Twenty-two samples of identified bones, wood charcoal from a hearth feature, and plant remains provided AMS dates all in good agreement (Pitulko et al. this volume; Pitulko and Pavlova 2010). Dates range from 28,570 ± 300 (Beta-191322) to 26,680 ± 160 (Beta-191334) ^{14}C (34,100–31,000 cal) yr BP. Two bone dates from Nepa-1 of 33,100 ± 1500 (AA-27382) and 26,065 ± 300 (AA-8885) ^{14}C (41,100–30,300 cal) yr BP indicate an age at least as old as Yana RHS (Goebel 2004b). Two hearth-charcoal samples from Ust' Karakol produced three dates in good agreement, ranging from 27,020 ± 435 (SOAN-3356) ^{14}C to 26,305 ± 280 (SOAN-3261) ^{14}C (32,300–30,500 cal) yr BP (Derevianko et al. 1998, 2003). All three of these sites have occupation layers in good agreement with each other, except for the old date from Nepa-1. Very little work has been undertaken and reported at this site (Goebel 2004b). It could be that there were two occupation events, one EUP followed by a later MUP occupation. Or perhaps the younger date is aberrant because it was an early AMS date run on bone, probably without pretreatment levels used on more recent bone samples. The other reasonably well dated MUP cultural occupations number at least 16, are distributed south of 60° N, and fall within the age range of about 26,000–20,000 ^{14}C (30,500–23,500 cal) yr BP. Many of these date to the last 3000 years of this period, corresponding to the MIS-3 to MIS-2 transition and increased cooling with the gradual onset of the last glacial maximum (LGM) and include occupations at Mal'ta, Buret', Kunalei, Ui-1, Novoselovo-13, and Kashtanka-1, to name a few (Graf 2009; Medvedev et al. 1996; Goebel et al. 2000a).

MUP Technologies

MUP lithic assemblages are blade-based and flake-based technologies. Raw materials are typically fine-grained, high-quality stones, including chert, siltstone, meta-siltstone, quartzite, argillite, and mudstone. Fine-grained igneous stones such as basalt and andesite were also occasionally procured as well as coarser stones such as quartz, granite, gabbro, diorite, tuff and sandstone (Abramova et al. 1991; Buvit et al. 2011; Derevianko et al. 2003; Drozdov et al. 1990; Graf 2010; Lisitsyn 2000; Medvedev 1998b; Pitulko et al. this volume; Terry et al. 2009; Vasil'ev 1996, 2000). Most raw materials were local, found in nearby stream alluvium, as evidenced by the common presence of alluvial-cobble cortex on debitage and tool blanks; however, others were obviously nonlocal, some being procured from very distant sources (Buvit et al. 2011; Graf 2010; Pitulko et al. this volume).

Primary reduction strategies were often split between production of blades, bladelets, and flakes as tool blanks (Graf 2010). Blade cores range in form from flat-faced to subprismatic. They also vary in size from large to quite small, so their detached tool blanks range in size from blade to bladelet, depending either on the stage of reduction when discarded or the size of the initial raw-material package (i.e., cobble versus pebble) (Graf 2008, 2010; Terry et al. 2009). Multidirectional, bidirectional, and unidirectional flake cores evidence systematic removal of flakes from one or more fronts. Occasionally bifacial cores were produced (Graf 2010). Secondary-reduction activities largely centered on manufacturing unifacial, bifacial, and burin tools on blades, bladelets, and flakes. Bifacial tools are present in many site assemblages; however, their frequency within assemblages is typically low (i.e., in Enisei river assemblages they make up < 25% of a tool assemblage [Graf 2010]). Superb examples can be found at the sites of Derbina 4/5 (Enisei) and Ust' Kova and Igeteiskii Log (Angara) (Akimova et al. 2003; Goebel 2004a; Medvedev 1998b). MUP tool types include retouched blades, bladelets and flakes, side scrapers, end scrapers, bifaces, gravers, notches, burins, and wedges (Abramova et al. 1991; Buvit et al. 2011; Graf 2008, 2010; Medvedev 1998b; Terry et al. 2009).

Osseous tool assemblages are dominated by antler, bone, and ivory projectile points. Points come in different sizes, depending on their raw material (e.g., mammoth ivory/bone or horse bone versus cervid bone or antler). They are unslotted, typically undecorated, often beveled at one end, and found in most MUP sites that contain well-preserved faunal remains. Some, however, are thin, long (> 20 cm) rod-type points such as those from Yana RHS, Mal'ta, Buret' and Igeteiskii Log (for examples see Pitulko et al. this volume). Long ivory spear shafts were also found at Yana. Other utilitarian implements include mostly retouchers/billets, awls, and needles (Abramova et al. 1991; Kirillov and Derevianko 1998; Lisitsyn 2000; Medvedev 1998b; Pitulko et al. this volume; Vasil'ev 2000).

Nonutilitarian, art forms are common and quite spectacular in the MUP. These include mostly carved mammoth-ivory pieces that can be divided into personal adornment and symbolic "mobile" art. Personal adornment pieces are numerous; found in several MUP assemblages such as Shestakovo, Achinsk, Sabanikha, Kurtak-4, Ust' Kova, Mal'ta, Buret', Sokhatino-4 and Yana; and include undecorated and decorated beads, drop pendants, and flat-form rectangular and disk-shaped pendants made on ivory, and tooth pendants made on fox and cervid canines and incisors, respectively. Additionally, stone beads and pendants have also been found at Mal'ta, Yana, and Kurtak-5. Mobile art pieces include engraved ivory plaques or badges (Achinsk, Mal'ta), enigmatic rod-shaped pieces (Achinsk), zoomorphic figurines such as enigmatic "beasts" resembling the outlines of mammoths, bison, or bears (Ust' Kova, Mal'ta, Yana RHS), swans or other birds (Mal'ta, Buret'), and anthropomorphic forms called Venus figurines (Mal'ta and Buret'). These Venus figurines date to the same time as most found in western Eurasia; however, unlike Western versions the female form on Siberian pieces is carved in 2D instead of 3D and full-body winter clothing with hoods is also carved on these pieces (Abramova 1995; Drozdov et al. 1990; Kirillov and Derevianko 1998; Lisitsyn 2000; Medvedev 1998a; Pitulko et al. 2012, this volume; Vasil'ev 2000).

MUP Fauna

Kitchen lists from the MUP tell us that a wide variety of fauna were utilized, from large to small taxa (e.g., mammoth, woolly rhinoceros, horse, steppe bison, auroch, Irish elk, Argali sheep, Siberian mountain goat, Saiga antelope, red deer, roe deer, reindeer, Arctic fox, red fox, and hare). From these faunal lists, one major pattern emerges that is worth noting here. Unlike the EUP, not all taxa are represented in all assemblages of the MUP. Investigating further with MNI data, Ui-1 and Kashtanka-1 assemblages indicate a focus on taxa specific to these locations. The assemblage from the upland site of Ui-1 contains mostly upland taxa (Siberian mountain goat and Argali sheep), and the assemblage from the Kashtanka-1 site, situated in a more lowland/plain location, is dominated by reindeer. Feasibly these two sites represent special-task locations where hunters extracted local ungulate resources, perhaps during the rut season. Numerous other sites without MNI data but with short faunal lists also hint at being short-term, special-task locations (Lisitsyn 2000; Vasil'ev 2003a). In contrast to this pattern, the faunal assemblage from Mal'ta is highly varied with at least 13 taxa represented, but no one type of animal is present in high frequencies, except for reindeer in which counts are mostly of antler. A similar pattern is also true for Yana, where high numbers of varied taxa are present (Pitulko et al. this volume). Based on faunal data, Mal'ta and perhaps Yana may have been residential sites or base camps. Faunal assemblages from other sites such as Buret', Kamenka, Sabanikha, and Kurtak-4 also hint at this pattern due to their wide variety of taxa (Ermolova 1978; Lisitsyn 2000; Vasil'ev 2000, 2003a).

MUP Features

Hearth features abound in sites of the MUP, in which both prepared and unprepared hearths were discovered. Some sites such as Ui-1, Kashtanka-1, Novoselovo-13, Kurtak-4, and Kunalei have just a few hearths associated with lithic and bone scatters, signaling them as sites used as short-term, special-task locations. Dwellings have been proposed at several sites. Some were possibly substantial, consisting of centrally located fireplaces and storage pits surrounded by boulder and stone-slab construction materials (Achinsk, Mal'ta, Buret', and Chitkan [Konstantinov 1994; Larichev et al. 1988; Medvedev 1998b]). Though no clear dwelling or hearth features were observed at Priiskovoe, the relatively tight distribution of several cobbles (24 m^2) coupled with heavy concentration of lithic debris has led some to interpret this combination as a dwelling (Buvit et al. 2011; Konstantinov 1994). At Yana (Northern Point Locality) two linear alignments of hearth features may represent at least two "lightly-framed" dwelling structures (Pitulko et al. this volume). A slab-lined hearth feature at Ui-1, coupled with discrete distribution of lithic materials found around it, led Vasil'ev (1996, 2003b) to hypothesize that a possible light, above-ground structure once stood at this seasonal hunting camp. Finally, a double burial feature, containing the remains of two children under the age of four, was found at Mal'ta (Alekseev 1998). Together with the very late Ushki Lake burial, these are the only burial features reported for the Siberian Paleolithic; all other human remains come from isolated finds and not associated with burial features (Akimova et al. 2005, 2010a; Gerasimova at al. 2007; Kuzmin et al. 2009). The Mal'ta children were interred with a wide array of grave goods, including a beaded necklace with pendants, osseous projectile point, unifacial stone tools, bone bracelet, and an ivory plaque and bird figurine (Okladnikov 1940).

MUP Summary

Siberian MUP sites have a wide distribution, forming a large triangle from southwestern Siberia (~51° N/85° E), north to western Beringia (~71° N/135° E), and back south to the Transbaikal in southeastern Siberia (~52° N/113° E). Interestingly, the oldest dated occupations, which emerge at roughly the same time (~34,000–31,000 years ago), are found along the southwest-to-northeast side of this scalene triangular distribution with Yana to the northeast, Nepa-1 in the middle, and Ust' Karakol to the southeast. The current record lacks other MUP sites between Yana and Nepa-1, and for the 7500 years following this initial incursion north, MUP occupations remains south and east of the Yana-Nepa-Ust' Karakol line.

MUP artifact assemblages are based on flake-core and blade-core reduction. Strikingly, most sites indicate reliance on informal flake over blade production, and those sites dating to the final 3500 years of the MUP (~27,000–23,500 cal BP) evidence strong use of bladelets, as a result of economizing raw material or of consistently selecting small raw-material packages (i.e., small alluvial cobbles). Most assemblages have an elaborate osseous industry. Most projectiles are made on bone, antler, or ivory, except for a few bifacial projectiles found at Ust' Kova and Derbina. Sites with small artifact assemblages tend to be short-term, logistical campsites, while sites with hordes of interesting decorative and artistic pieces reflect longer-term residential sites. Faunal-assemblage compositions and types of domestic features also support this interpretation. The record suggests MUP hunter-gatherers were logistically mobile, perhaps seasonally revisiting residential bases and associated spike camps.

Late Upper Paleolithic

Across Siberia there are hundreds of sites reportedly containing LUP cultural occupations (Abramova et al. 1991; Derevianko 1998; Goebel 2002a). As can be expected, variations in LUP assemblages across regions exist and have led to development of different, regional archaeological "cultures" of the period. Perhaps most notable to American scholars are the Afontova, Kokorevo (Vasil'ev 1992), and Diuktai cultural traditions (Yi and Clark 1985). Some have abandoned such notions (Graf 2011; Pitulko et al. this volume; Vasil'ev 1992, 1996, 2000 but see 2011), but many still adhere to them (Akimova et al. 2005; Derevianko 2010; Lisitsyn 2000). In this chapter the LUP is treated as above, a chronological phase that has patterns of technological, subsistence, and overall landscape organization characteristic for the phase.

LUP Distribution and Chronology

LUP sites are distributed east from the Ob' to the Pacific, north from the Russian border to Beringia, and found in places previously uninhabited, specifically the Russian Far East and western Beringia east of the Yana River (Sakhalin Island, Kamchatka, and Chukotka) (Slobodin 2011; Vasilevskii 2008). Northern Siberia, north of about 60° N and west of the Lena River, is devoid of LUP sites, but seems to have been inhabited by the middle Holocene (Pitulko and Pavlova 2010). As you will see below, sites become younger from south to north.

Ogon'ki-5, located on Sakhalin Island, may represent the earliest LUP site in Russian Northeast Asia. During the early half of the last glacial cycle (including LGM), Sakhalin was connected to both Hokkaido, Japan, and mainland Siberia via land bridges (Ono and Machida 1987). Four AMS dates on hearth charcoal are in good agreement and indicate an age range of 19,440 ± 140 (Beta-115987) to 18,920 ± 150 (AA-25343) ^{14}C (23,600–22,200 cal) yr BP. The next youngest is Studenoe-2 in the Transbaikal (Buvit and Terry 2011; Goebel et al. 2000b; Goebel 2002a). Once thought to date to about 17,500 ^{14}C yr BP (Goebel 2002a), detailed geoarchaeological research coupled with new dates led Buvit and Terry (2011) to argue the occupation happened a little earlier, from 18,020 ± 230 (AA-67845) to 17,550 ± 90 (AA-37964) ^{14}C yr BP or 22,200–20,500 cal yr BP. The selected age range is based on four congruent dates on wood charcoal from four hearth features associated with a dwelling complex (Buvit and Terry 2011; Konstantinov 2001; Goebel et al. 2000). The next youngest site is Nizhnii Idzhir-1 in the Enisei valley, dating to 17,200 ± 70 (LE-1984) ^{14}C (21,100–20,100 cal) yr BP (Astakhov 2008). Though this is based on but one ^{14}C date, the date comes from a clean context where the hearth feature is surrounded by a dense artifact scatter averaging 5 cm thick across the excavation (25 m^2) (Astakhov 2008).

Overwhelmingly, most other LUP occupations found in good geoarchaeological settings are situated south of 56° N and postdate these ages. A cluster of early LUP sites approaching western Beringia and situated along the Aldan River have long been discussed in the context of the peopling of Beringia and the Americas (Chard 1974; Goebel 1999; Holmes 2011; Mochanov 1977; Powers 1973; Yi and Clark 1985). The most reliable dates come from Diuktai Cave. The earliest LUP layer dates to about 13,200 ± 250 (GIN-405) to 13,090 ± 70 (LE-784) ^{14}C (16,800–15,100 cal) yr BP. Though critical of the other early open-air Aldan LUP sites (e.g., Ikhine and Ust' Mil'), Yi and Clark (1985) tentatively accept dates and stratigraphic context of artifacts from Verkhne Troitskaya, giving an average date of 16,615 ^{14}C yr BP for the occupation. The problem is that this average was calculated on four dates that range from 18,300 ± 180 (LE-905) to 14,530 ± 160 (LE-864) ^{14}C yr BP (Mochanov 1977; Tseitlin 1979) and do not overlap, even at 2σ. The dating of the Verkhne Troitskaia artifacts is just as problematic as the dating of Ikhine and Ust' Mil' cultural materials because the samples were pieces of wood found dispersed in 80 cm of alluvial sediment overlying the artifacts. Artifacts were found dispersed below in a 100-cm-thick zone of fluvial sediments that, from Mochanov's (1977:59) description, represents an active stream bed. It is very difficult to accept that artifacts and dated samples were found in primary depositional contexts. Unfortunately, there are no characteristic LUP sites from dated contexts in northeastern Siberia, east of Diuktai Cave, that clearly predate the Clovis era in the Americas (Slobodin 2011; Waters and Stafford 2007).

LUP Technologies

LUP assemblages are flake-based, microblade-based, and blade-based technologies. Raw materials are typically of the same types found in MUP assemblages, chert, siltstone, meta-siltstone, quartzite, argillite, mudstone, basalt, andesite, quartz, granite, gabbro, diorite, tuff, and sandstone (Abramova 1989; Abramova et al. 1991; Buvit and Terry 2011; Graf 2010; Lisitsyn 2000; Vasil'ev 1996; Terry et al. 2009). In the Enisei, most raw materials were local from nearby alluvium with a few nonlocal stones used (Graf 2010). Data from the Transbaikal region, however, suggest most raw materials were procured from nonlocal sources (Terry et al. 2009).

Primary reduction strategies led to production of flakes, blades, and microblades (Graf 2010). Blade cores are typically of the large, flat-faced variety. Flake cores are multidirectional, unidirectional, bidirectional, bifacial, or bipolar. Microblade cores are either wedge-shaped (manufactured on bifaces) or tortsovyi cores (manufactured on flakes or small cobbles and pebbles) (Abramova et al. 1991; Gómez Coutouly 2011; Graf 2008, 2010; Terry 2010; Terry et al. 2009). Secondary-reduction activities included manufacturing unifacial, bifacial, and burin tools on blades, bladelets, and flakes (including bifacial thinning flakes). Typical LUP lithic-tool types include side scrapers, end scrapers, retouched flakes and blades, bifaces, gravers, burins, bifaces, and to a lesser extent notches, denticulates, and wedges (Abramova et al. 1991; Graf 2008, 2010; Lisitsyn 2000; Terry et al. 2009). Bifaces as tools are present in many site assemblages (Graf 2010). LUP sites in the Aldan river valley typically contain finished lanceolate points, some with over-face flake scars (Mochanov 1977).

Osseous technologies centered on producing tools such as bone, antler, and ivory points, awls, needles, retouchers, and shaft straighteners (i.e., *"baton de commandement"*) (Abramova 1979a, 1979b; Abramova et al. 1991; Akimova et al. 2005; Gening and Petrin 1985). Projectile points are slotted along their lateral margins, probably with burins or gravers from associated toolkits. Microblade midsections were inserted into these slots to produce very sharp, lethal spear tips. A few examples of points with microblade inserts still in place exist across Siberia (e.g., Chernoozer'e and Listvenka (Akimova et al. 2005; Gening and Petrin 1985). We know these points were used to hunt because two examples of microblade-composite projectiles were found embedded in mammoth and bison bones at Lugovskoe (western Siberia) and Kokorevo-1 (Enisei), respectively (Abramova 1979b; Zenin et al. 2006). Despite the fact that many sites with well-

preserved faunal remains also have osseous artifacts in their assemblages, nonutilitarian examples are rare. When present, they typically consist of bone beads and pendants sometimes with abstract engravings (e.g., Chernoozer'e, Kokorevo, Afontova Gora, Tashtyk, Ui, Maina, Listvenka, and Studenoe-2) (Abramova 1979a, 1979b, Abramova et al. 1991, Akimova et al. 2005; Astakhov 2008; Konstantinov 2001). Finally, only one uncontested piece of non-personal-adornment art comes from the LUP, an anthropomorphic clay statuette from Maina (Vasil'ev 1996).

LUP Fauna

Faunal remains from LUP assemblages are quite numerous (Vasil'ev 2003a). Again, however, analyses of these data are limited mostly to kitchen lists; however, a few sites do contain NISP and MNI data. At least 29 taxa are represented in LUP assemblages on whole. Using Vasil'ev's (2003a) massive faunal lists for the Paleolithic, there are several patterns to point out. Of 256 LUP occupation assemblages, the leaders are clearly bison and reindeer. These two are present in 141 and 132 assemblages, respectively with red deer, caprids, mammoth, and horse coming in close behind them. There is some regional variation, with bison and caprids selected most often in southwestern Siberia; bison and reindeer in the Enisei; horse and reindeer in the Angara; red deer and reindeer in the Transbaikal; and horse, bison and reindeer in western Beringia. Another interesting pattern is that wolf/dog is present in at least 37 assemblages, whereas during the MUP only 5 occupations have wolf and during the EUP they are present almost exclusively at cave sites. Perhaps this pattern of many wolves/dogs in LUP assemblages reflects their use as beasts of burden during the Late Glacial. Assemblages with NISP and MNI data indicate that a single species dominates any given assemblage. These taxa were bison, caprids, reindeer, hare, and red deer. Together, faunal data demonstrate a focused hunting strategy was in play during the LUP.

LUP Features

LUP hearth features are fairly common across Siberia; however, these typically appear as isolated, unprepared hearths associated with localized lithic scatters (Akimova et al. 2005; Astakhov 1999, 2008; Gening and Petrin 1985; Konstantinov 1994, 2001; Lisitsyn 2000). In the Enisei, 17 of 23 ^{14}C-dated LUP sites contain at least one hearth feature, yet 85 distinct cultural layers are documented at these sites (Graf 2008). Certainly, preservation issues and excavation techniques can hinder observation and documentation of hearth features, but this low proportion of hearths-to-occupation numbers indicates some sites were only visited for very short periods of time.

Unlike western Eurasia, LUP dwellings are fairly rare in Siberia. The sites of Studenoe-1, Studenoe-2, Ust' Menza-1, Ust' Menza-2, Ust' Menza-3, and Kosaia Shivera in the Transbaikal and Listvenka and Ui-2 in the Enisei have circular or semi-circular alignments of boulders and stone slabs, containing lithic debris and hearth features within these alignments (Akimova et al. 2005; Konstantinov 1994, 2001; Vasil'ev 1996), providing the best evidence of dwellings during the LUP. Some have proposed additional dwelling features at Chernoozer'e, Kokorevo-1, Golubaia-1, Nizhnii Idzhir', Ui-2 and Maina, but this is based on arrangements of chipped-stone lithic and faunal debris around hearths (Abramova 1979b; Astakhov 2008; Gening and Petrin 1985; Vasil'ev 1996, 2003b). These distributions could simply be explained as knapping stations or animal-processing areas, so their interpretation as dwelling features remains equivocal (Vasil'ev 2003b).

LUP Summary

Siberian LUP sites outnumber those that came before. They adhere to the same basic distribution of the MUP; however they extend into reaches of the Russian Far East that were previously unoccupied by modern humans. The earliest appearance of microblade-bearing technologies (a diagnostic feature of LUP assemblages) appears first on the late-Pleistocene-aged Hokkaido/Sakhalin Peninsula, next to the west in the Transbaikal, and then farther west in south-central and central Siberia soon afterward. By about 20,000–19,000 cal BP, LUP sites were springing up as far north as 56° N, and in the Aldan river valley by 16,000 cal BP. Investigations of the frequencies of ^{14}C-dated LUP occupations through the Late Glacial illustrate a trend of gradual increase through time with small population spikes during warm intervals (i.e., Bølling and Allerød interstades) and population nadirs during intervening cold periods (Oldest Dryas and Older Dryas interstades) (Goebel 2002a; Graf 2005, 2009).

LUP artifact assemblages are internally consistent with lithic industries based on flake-core, microblade-core, and blade-core reduction with many assemblages containing more flake than blade production. Microblade-osseous composite-point production was prevalent throughout the LUP, evidenced by microblade cores, microblades, and slotted points. Though working of osseous materials centered on production of utilitarian implements, production of personal adornment did not cease, but production of other art forms did. The faunal record indicates a focus on specific, mostly large-game, taxa at most sites. This faunal pattern coupled with the near lack of any substantial dwellings suggests people of the LUP were on the move, perhaps frequently traveling between sites. Provisioning and tool-richness data from the Enisei demonstrate that individuals within LUP communities were being provisioned and most LUP sites reflect residential bases (Graf 2010, 2011). Combined archaeological data indicate LUP hunter-gatherer groups were highly mobile, frequently moving across the landscape.

Interestingly, two sites do not fit this overall LUP pattern and should be mentioned because they were found in western Beringia and date to the Allerød interstade just before and during the Clovis era. The sites of Berelekh and Ushki Lake, located along the lower Indigirka River in northwestern Beringia and Kamchatka River on the Kamchatka Peninsula, respectively, have biface-based and flake-based assemblages with bifacial teardrop-shaped (Berelekh) and stemmed (Ushki)

projectile points and preforms, unifacial tools on flakes and blades, and no clear association with microblades; however, the teardrop-shaped point from Berelekh was found in a surface context (Dikov 1968; Mochanov 1977; Pitulko 2011; Vereshchagin 1977). Dwelling and burial features were identified at Ushki Lake. Dates from these cultural occupations suggest an age of about 11,500–11,000 ^{14}C (13,700–12,700 cal) yr BP (Goebel et al. 2003, 2010; Pitulko 2011). Overall, data from these two sites do not fit the typical LUP pattern, but these sites are very late, dating to the terminal Pleistocene, so it is difficult to compare them with other LUP occupations of late-glacial age.

Discussion

Were EUP Hunter-Gatherers Poised to People the North?

Modern humans first dispersed to southern Siberia by about 50,000 years ago. These initial settlers were making blade-based Upper Paleolithic technologies, similar to those used by contemporary early modern humans in other regions of the Old World, and they were opportunistically hunting a wide array of fauna. Their technologies were sophisticated. They were making prepared lithic technologies, and presence of awls and needles suggests they were manufacturing and mending clothing and other items made of animals skins. It would appear that they were technologically equipped to push into northern landscapes. They were hunting a variety of northern fauna, and also fauna found in more moderate climates today, and they seem to have maintained their population in southern Siberia during a period of relative warmth. Though land-use strategy and provisioning data are scanty at best, they do suggest people were tied to local resources, not ranging long distances, and using a logistical mobility strategy. Early modern humans in southern Siberia seemed to have been just learning northern landscapes, populations were probably not large, and they were likely not poised to disperse to Beringia and the Americas.

Why Did the MUP Expansion Happen and What Does It Mean for Human Dispersals to the Americas?

Clearly the presence of Yana in northwestern Beringia at 32,000 years ago is quite magnificent. Material remains found so early so far north is truly eye-opening and indicates that by the MUP people were capable of expanding north into the Arctic and Beringia. MUP knappers expanded their toolkits to include a wider array of implements so they were better prepared. For instance, people used a range of techniques to produce projectile technologies, not just osseous points, but also bifacial points were now being made. MUP tool makers were selecting from a greater list of raw-material types, probably because they had grown accustomed to the sources in their territorial ranges and had learned where quality raw materials were located, perhaps even beyond typical territory limits (e.g., amber found in the Yana assemblage came from 600 km away [Pitulko et al. this volume]). There seems to have been greater variability in producing osseous implements. The wider range and increased numbers of awls and needles may signal increased clothing manufacture and repair. The relative explosion in symbolic, "mobile" art across Siberia suggests maintenance of social networks. Faunal data indicate varied site functions among MUP sites, with large residential bases and small, short-term hunting camps. Largely the taxa in these assemblages are cold- and dry-adapted species, many herd animals that made up the mammoth-steppe of Eurasia (Guthrie 1990). These faunal data fit climatically since most MUP sites date to the 4000 years immediately preceding the LGM and the oldest sites (Yana and Nepa-1) are in northern settings (Goebel 1999). Settlement data indicate a well-established logistical system with large, long-term residential bases and resource-extraction sites, perhaps revisited annually or biannually on seasonal bases.

During the height of the warm Lipovo-Novoselovo interstade, MUP populations expanded north to such places as the Nizhnaia Tunguska river valley in central Siberia and Indigirka river valley of western Beringia, where they thrived, hunting mammoth-steppe fauna, not just for food procurement, but also for toolmaking and creating mobile art that was visual and symbolic for maintaining distant social networks (Meltzer 2009; also see Flegenheimer et al. this volume). As temperatures began to fall and climate declined between 28,000 and 23,000 cal BP, the MUP range shrank south, reflected by the multitude of later sites scattered across the south and the abandoning of Yana by 31,000 years ago. As the record stands now, it is difficult to expect the MUP to have contributed in a direct way to dispersal into the Americas from a Beringian springboard, unless such a dispersal event took place between 34,000 and 31,000 cal BP. At this time, the eastern Beringian record simply does not support this (Holmes 2011; Potter et al. this volume).

Where Did They Go?

Siberia during the LGM was a harsh place, with countless paleoecological records including ice-wedges, cryoturbated loams, and various pollen and faunal records evidencing this phenomenon (Elias and Brigham-Grette 2007; Miller et al. 2010). There has been much debate centering on whether or not people were in Siberia during the LGM (Davis and Ranov 1999; Dolukhanov et al. 2002; Goebel 1999, 2002a; Graf 2005, 2008, 2009, 2010; Kuzmin and Keates 2005; Kuzmin 2008). In this debate, I have fallen clearly on the side of no. Data from Ogon'ki 5 coupled with recent work at Kashiwadai in Hokkaido, Japan (Izuho and Takahashi 2005; Nakazawa et al. 2005) suggest there were LGM refugia for humans just outside of Siberia proper, in the Russian Far East and northern Japan. The overwhelming pattern in interior Siberia, however, still suggests abandonment. Even if some populations found refuge in isolated, more productive areas during the LGM, the archaeological record does not support continued occupation of northern Siberia and Beringia at this time, despite recent modeling by geneticists (Mulligan and Kitchen this volume).

Dispersal Back North

The Siberian LUP may have begun in the Russian Far East during the LGM. One of the hallmarks of the LUP is microblade technology. This technological strategy probably originated in an area outside of southern Siberia because the best evidence to date for LGM-aged sites with microblade technologies in Northeast Asia comes from the Kashiwadai site and Ogon'ki-5 as mentioned above. Perhaps this region provided an LGM refugium for both people and mammals alike. Remains of LGM-aged gregarious herd fauna were found on the Hokkaido/Sakhalin Peninsula (Izuho and Takahashi 2005), signaling a productive mammoth-steppe-like landscape. Perhaps hunting concentrated large-herd fauna led to development of microblade-osseous composite projectile point technology.

Determining the origins of Siberian microblade technology is an interesting problem because it seems to be intricately tied to when and where people were during the LGM and how parts of Siberia were repopulated via a late-glacial dispersal north. After the occupation of Ogon'ki and Studenoe, LUP sites begin emerging quickly to the west and eventually north of Lake Baikal, making it to western Beringia by 16,000 years ago and then to eastern Beringia by 14,500 years ago (Holmes 2011). The organization of technologies and subsistence indicates these people were highly mobile as a group and therefore could have quickly dispersed farther west, deeper into southern Siberia and north to Beringia. Why would they choose high residential mobility when their MUP predecessors did not? Perhaps it became an economical way to pursue mobile herd fauna, which were becoming more dispersed during the late-glacial demise of the mammoth steppe, especially if human populations were increasing between 20,000 and 17,000 cal BP (Goebel 2002a; Graf 2005). Could group mobility have been facilitated with the help of dogs carrying gear or even pulling sleds? Siberian LUP faunal assemblages, archaeological evidence of domesticated dog in European Russia at 17,000 cal BP (Sablin and Khlopachev 2003), and recent DNA studies that contend East Asia was the homeland of dog domestication during the Late Glacial (Ding et al. 2012; Savolainen et al. 2002) may all hint at this as a possibility.

Concluding Remarks

The Siberian Upper Paleolithic record suggests at least two dispersal scenarios to Beringia and therefore provides two possible time frames for Beringians to disperse to the New World. Before Yana was discovered, geneticists predicted a pre-LGM dispersal to Beringia (Bonatto and Salzano 1997). Clearly people of the MUP dispersed to western Beringia at about 34,000–31,000 years ago and were therefore poised to head to Alaska at this time. Was the Bering Land Bridge open at this time? There are indications that the onset of the LGM began in the Arctic as early as 32,000–31,000 years ago so it was likely open (Elias and Brigham-Grette 2007; Elias and Crocker 2008). The land bridge may have been open, but by 31,000 years ago conditions may have become too harsh to sustain human population this far north. After Yana, there is no trace of humans in or near Beringia until people camp at Diuktai Cave at least 14,000 years later. If MUP hunter-gatherers contributed directly to initial dispersals to America, then this dispersal event must have taken place before 31,000 years ago, very soon after Yana was reached. When reaching Alaska, however, it is highly likely that the northern end of the North American ice sheets had already coalesced. To date, we have no evidence of people in eastern Beringia before 14,500 years ago. Did people of the LUP disperse to the New World after the LGM? There is very good evidence of this position. LUP people had reached Diuktai Cave, the gateway to Beringia, no later than 16,000 years ago and perhaps as early as 17,000 years ago. Certainly, the "pre-Clovis" site of Swan Point provides excellent evidence of LUP people in eastern Beringia by 14,500 years ago.

Geneticists tell us that the founding population of First Americans consisted of as many as 1000 people and was positioned in Beringia during the LGM (Kitchen et al. 2008; Mulligan and Kitchen this volume; Tamm et al. 2007). The archaeological record indicates a small population in western Beringia at 32,000 years ago, and paleoecologists think the LGM may have begun in Beringia soon afterward. Perhaps the climate was too cold and dry to maintain a recognizable human population through the LGM. The archaeological record indicates by 16,000 years ago people with LUP technologies were positioned in western Beringia to disperse east to the New World. Could the genetic clock be off? Is the archaeological record too coarse-grained to detect an LGM population? Either way, we still have a lot of work ahead to discover the answers.

Acknowledgments

Thanks to two reviewers for providing insightful comments and suggestions. I want to thank Russian colleagues who have provided access to collections and Russian literature. I also acknowledge the Center for the Study of the First Americans and Department of Anthropology, Texas A&M University for logistical support and the Arctic Social Sciences Program, National Science Foundation (awards #0525828 and #1019190) for supporting travel to Russia to collect data used in this chapter.

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