THE MIDDLE TO UPPER PALEOLITHIC TRANSITION IN SIBERIA: CHRONOLOGICAL AND ENVIRONMENTAL ASPECTS

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Abstract

The chronological and environmental patterns of the Middle to Upper Paleolithic transition are considered in this review based on the results of recent excavations and studies done mostly in the 1990s and early 2000s. Radiocarbon dates, derived from both Middle Paleolithic (MP) and early Upper Paleolithic (EUP) complexes in Siberia were used after critical evaluation to reveal the main chronological features. Palynological, paleopedological, and paleontological data document past environmental conditions. It was found that the MP complexes existed in Siberia for a long time, until ca. 30,000–27,000 14C BP. The emergence of the EUP can now be dated to at least ca. 43,000 14C BP in the Altai Mountains, and to ca. 38,000 14C BP in the Transbaikal region. The presence of objects of personal adornment at both Kara-Bom and Khotyk, dated to ca. 43,000–38,000 14C BP, documents the very early appearance of symbolic behavior in the EUP of Siberia. Coexistence of MP and EUP complexes in Siberia between ca. 43,000–30,000 14C BP is evident from current data. The age of the EUP assemblage from Kara-Bom, concurrent with the Levantine EUP Ahmarian complex of Boker Tachtit and older than any EUP sites in Europe, requires the revision of existing models of the origin and spread of both modern humans and the Upper Paleolithic into Eurasia.

INTRODUCTION

Since the end of the 1980s, when data on the origin of anatomically modern humans (Homo sapiens sapiens) were synthesized (e.g., Nikecki and Nitecki, 1994), new information came to light, especially in Siberia and neighboring Asia. In Europe, several new finds were also made; comprehensive reviews of the available evidence on the earliest modern humans and Upper Paleolithic cultural complexes, which are closely related, were published (e.g., Churchill and Smith, 2000; Bar-Yosef, 2002; Conard and Bolus, 2003; Pavlov et al., 2004; Brantingham et al., 2004; Hoffecker, 2005; Mellars, 2004, 2006a, 2006b).

Today we are equipped with enough material to reveal the main patterns of the Middle to Upper Paleolithic transition and the emergence of the Upper Paleolithic in Siberia. This paper touches upon two lines of evidence, chronology and environment of the Middle to Upper Paleolithic transition in Siberia and neighboring Eurasia, and is based on the results of recent progress in this field (Derevianko, 2005). Some aspects of the chronology of the Middle to Upper Paleolithic transition in Siberia have been briefly mentioned before (Kuzmin, 2004, 2007a, 2007b).

MATERIAL AND METHODS

The area under consideration includes the southern part of Siberia, from the Altai Mountains in the west to the Transbaikal region in the east (Fig. 1). Here both archaeological excavations and geoarchaeological studies were conducted mainly since the 1950s, and the results obtained up to the end of 1980s have been summarized (Derevianko et al., 1998a). Since the 1980s, several well-stratified Middle Paleolithic (MP) and early Upper Paleolithic (EUP) complexes were
excavated and studied (Derevianko, 2005). In this review, original Russian sources and their English versions (when available) are used, and in cases where only Russian publications exist the translations of paper titles are given along with the transliteration of original volume titles, following the recent publication on the archaeology of far eastern Russia, edited by Nelson et al. (2006).

In this overview, sites with well-established stratified sequences of both MP and EUP complexes are included. In the Altai Mountains, the primary sites are Denisova Cave, Kara-Bom, Ust-Karakol 1, and Strashnaya Cave (Fig. 1). In the Transbaikal, Khotyk 3 is the single well-documented site with MP superimposed by EUP cultural layers (Fig. 1). Besides these sites, there are some other Siberian localities which have less securely established sequences of the MP and EUP, Dvuglazka, Kur tak 4, and Arta 2 (Fig. 1), and their critical evaluation is also presented. As concerns the typological definition of the EUP complexes at the sites under consideration, several well-accepted criteria were used (Bar-Yosef, 2002: 365–368; Vishnyatsky, 2004: 42): the presence of blade production; volumetric flaking; scrapers and chisel-like tools; bone tools, items of personal adornment, and art objects.

Paleoenvironmental data are taken from two main sources: a) records of Upper Pleistocene vegetation and climate, derived from sediment sequences (see recent summary: Arkhipov et al., 2005: 80–83), and b) archaeological sites under investigation. Radiocarbon dates are also an important part of archaeological studies of the Middle to Upper Paleolithic transition within this large region. In order to evaluate quality and reliability of available $^{14}$C records, the ‘chronometric hygiene’ approach (see, for example: Kuzmin, 2006: 362–363) is applied. The main criteria for the evaluation of $^{14}$C measurements are: 1) stratigraphic integrity at the given site; 2) material dated (charcoal generally thought to be better than bone); and 3) correspondence of $^{14}$C dates compared with the general chronological framework.
For comparison of $^{14}$C records between Siberia and Europe in terms of the emergence of the EUP, only uncalibrated $^{14}$C values are used. This is due to the fact that large uncertainties exist in the long calendar vs. $^{14}$C age datasets, such as cores from Lake Suigetsu and the Cariaco Basin, and the Bahamas speleothem (van der Plicht et al., 2004; Bronk Ramsey et al., 2006), preventing the proper calibration of $^{14}$C dates older than ca. 21,500 $^{14}$C years ago (BP). Given this, only approximate ‘comparison’ (sensu Bronk Ramsey et al., 2006) of the calendric age of a $^{14}$C measurement is possible.

RESULTS

Altai Mountains [Gorny Altai]

In this region of southern Siberia, there are at least four sites with MP and UP cultural layers in superposition: the open-air sites Kara-Bom and Ust-Karakol 1, and the cave sites of Denisova and Strashnaya.

Kara-Bom is one of the best studied sites (Derevianko, 2001; Derevianko and Rybin, 2003; Derevianko and Postnov, 2004; Derevianko et al., 2000, 2005a; Goebel, 2004; Goebel et al., 1993; Vasil’ev, 1993; Brantingham et al., 2001; see complete description: Derevianko et al., 1998b). The presence of objects of personal adornment, stone and bone pendants, and red ocher pigments and of a grinding pebble in the EUP layer 5 (Derevianko and Rybin, 2003) is worth mentioning.

The uppermost MP cultural layer 1 (MP-1) is $^{14}$C-dated to 42,000 $^{14}$C BP (AA-8873A) and 44,000 $^{14}$C BP (AA-8894A), both obtained on animal bone (e.g., Goebel et al., 1993; Kuzmin, 2004). The immediately overlaying lowest EUP of cultural layer 6 is dated to ca. 43,200 $^{14}$C BP, and EUP layer 5 to ca. 43,300 $^{14}$C BP (Table 1); both dates are run on charcoal collected from in situ hearths (Goebel et al., 1993: 454; Goebel, 2004: 172; Derevianko and Rybin, 2003: 33–38). Charcoal $^{14}$C values derived from primary contexts made the Kara-Bom EUP chronology quite secure, with the overlaying UP layers 4–3 $^{14}$C-dated to ca. 34,200–32,200 $^{14}$C BP (e.g., Derevianko et al., 2000).

Paleoenvironmental data for Kara-Bom are not numerous (see review: Derevianko et al., 2005a: 61). At the end of MP-1, vegetation was represented by a mixture of conifers and pine-birch formations (with some broad leaf taxa) and steppe communities, and was cooler than today. Faunal remains from the MP cultural layers 2–1 belong to horse (Equus sp.), woolly rhinoceros (Coelodonta antiquitatis), bison (Bison priscus), cave lion (Panthera spelaea), mammoth (Mammutus primigenius), cave hyena (Crocuta spelaea), and ibex (Capra sibirica) (Vasil’ev, 2003). The EUP vegetation was represented by conifer formations (with small admixture of broad leaf species) and steppes (Derevianko et al., 1998: 258–259), showing climatic conditions cooler than today. Mammal remains from EUP layers 6–5 were identified as horse, bison, ibex, and cave hyena (Derevianko et al., 2000: 38). In general, at the end of MP and during the EUP landscape structure of the Kara-Bom vicinity was of mosaic type, with steppes, forests, and forest steppes (Derevianko and Rybin, 2003).

The Ust-Karakol 1 site contains well-excavated MP and EUP complexes (Derevianko, 2001; Derevianko and Postnov, 2004; Derevianko et al., 2003). According to Otte and Derevianko (2001) the EUP layers 8–11 at Ust-Karakol 1 represent one of the earliest complexes with Aurignacian features in Siberia. Unfortunately, neither the youngest MP cultural layer (13) nor the oldest EUP layer (11) has been $^{14}$C-dated. The upper part of EUP layer 10 is dated to ca. 35,100 $^{14}$C BP using hearth charcoal. From the lower part of EUP layer 9, several $^{14}$C dates were produced on hearth charcoal: ca. 33,400 $^{14}$C BP, ca. 31,580 $^{14}$C BP, ca. 29,860 $^{14}$C BP, and ca. 29,720 $^{14}$C BP (Table 1) (Derevianko et al., 2005a: 59). The in situ position of the Ust-Karakol 1 cultural layers is reflected by the presence of undisturbed hearths in cultural layers 13, 11, and 9 (Derevianko et al., 2003: 244–246, 272), despite skepticism expressed by Dolukhanov et al. (2005: 1127), which in my opinion is based on two circumstances (see also Kuzmin and Keates, 2006: 890): 1) misunderstanding of the English translation of the original source, the guidebook of the 1998 field excursion (Derevianko et al., 1998c); and 2) unfamiliarity of P. M. Dolukhanov and co-authors (2005) with the original sources of the Ust-Karakol 1 material (Derevianko et al., 1998c: 60–67; Derevianko et al., 2003: 235–298). Instead, as
shown here, the $^{14}$C chronology of Ust-Karakol 1 is highly consistent.

Paleoenvironmental data for Ust-Karakol 1 are quite abundant (Derevianko et al., 2003). Large mammals from the MP layers 16–13 are represented mainly by horse ($Equus przewalskii$), red deer ($Cervus elaphus$), and bison, while in the EUP layers 12–7 horse, ibex, bison, and wild sheep ($Ovis ammon$) dominate. Rodent fauna and their paleoenvironmental interpretation shows that the MP layers 13 and 12 are characterized by cold, treeless conditions; the EUP layers 11–9 were formed during somewhat wetter environmental conditions with an increase of meadows and forest formations, compared with the latest MP occupations. Snails from the EUP layers 11–9 show the presence of coniferous-broad leaf forests in the immediate vicinity. Palynological data allow the reconstruction of forest steppe formations for the MP layers 13–12, with broad leaf species (elm, oak, linden, maple, and hornbeam), indicating generally mild climate. The EUP layers 11–9 existed in the environment of conifer forests and cool climate, with most arid conditions documented in layer 11, and wetter climate in layers 10–9.

Denisova Cave is one of the best-studied Paleolithic sites in Siberia, comprising a long sequence of human occupation, starting at least at the beginning of the Upper Pleistocene (Shunkov and Agadjanian, 2000) and possibly earlier (Derevianko et al., 2003: 110–111). It consists of a main chamber, an entrance area, and three smaller galleries (Derevianko et al., 2003: 67–68). The numerous objects of personal adornment from the EUP layers 11 and 9 in the main chamber, bone and stone beads, pendants, and rings (Derevianko and Shunkov, 2004), testify additionally in favor of the EUP type of the Denisova Cave assemblages from cultural layers 11–9. The recent finds of a bone ring, beads, pendants, eye needle, and polished stone bracelet made on serpentine in the upper part of the EUP layer 11 in the eastern gallery of the Denisova Cave, sandwiched between levels $^{14}$C-dated to ca. 48,650 $^{14}$C BP (lower part of layer 11) and ca. 29,200 $^{14}$C BP

<table>
<thead>
<tr>
<th>Region, site</th>
<th>Layer</th>
<th>$^{14}$C date, yrs BP</th>
<th>Lab Code and No.</th>
<th>Material dated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Altai Mountains</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Kara-Bom</td>
<td>6</td>
<td>43,200 ± 1500</td>
<td>GX-17597</td>
<td>Charcoal</td>
</tr>
<tr>
<td>Kara-Bom</td>
<td>5</td>
<td>43,300 ± 1600</td>
<td>GX-17596</td>
<td>Charcoal</td>
</tr>
<tr>
<td>Ust-Karakol 1</td>
<td>10 (upper)</td>
<td>35,100 ± 2850</td>
<td>SOAN-3259</td>
<td>Charcoal</td>
</tr>
<tr>
<td>Ust-Karakol 1</td>
<td>9 (lower)</td>
<td>33,400 ± 1285</td>
<td>SOAN-3257</td>
<td>Charcoal</td>
</tr>
<tr>
<td>Ust-Karakol 1</td>
<td>9 (lower)</td>
<td>31,580 ± 470</td>
<td>AA-32670</td>
<td>Charcoal</td>
</tr>
<tr>
<td>Ust-Karakol 1</td>
<td>9 (lower)</td>
<td>29,860 ± 335</td>
<td>SOAN-3358</td>
<td>Charcoal</td>
</tr>
<tr>
<td>Ust-Karakol 1</td>
<td>9 (lower)</td>
<td>29,720 ± 360</td>
<td>SOAN-3359</td>
<td>Charcoal</td>
</tr>
<tr>
<td>Denisova Cave, main chamber</td>
<td>11.4</td>
<td>&gt;37,235</td>
<td>SOAN-2504</td>
<td>Bone</td>
</tr>
<tr>
<td>Denisova Cave, eastern gallery</td>
<td>11 (upper)</td>
<td>29,200 ± 360</td>
<td>AA-35321</td>
<td>Charcoal</td>
</tr>
<tr>
<td>Denisova Cave, eastern gallery</td>
<td>11 (lower)</td>
<td>48,650 +2380/-1840</td>
<td>KIA-25285</td>
<td>Bone</td>
</tr>
<tr>
<td><strong>Transbaikal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Khotyk 3</td>
<td>3</td>
<td>38,200 ± 2800</td>
<td>AA-60267</td>
<td>Bone</td>
</tr>
<tr>
<td>Khotyk 3</td>
<td>3</td>
<td>32,120 ± 340</td>
<td>SOAN-5496</td>
<td>Bone</td>
</tr>
<tr>
<td>Khotyk 3</td>
<td>3</td>
<td>29,310 ± 370</td>
<td>SOAN-5495</td>
<td>Bone</td>
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<tr>
<td>Khotyk 3</td>
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<td>32,700 ± 1400</td>
<td>AA-60266</td>
<td>Bone</td>
</tr>
<tr>
<td>Khotyk 3</td>
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<td>28,770 ± 245</td>
<td>SOAN-5082</td>
<td>Bone</td>
</tr>
<tr>
<td>Khotyk 3</td>
<td>2</td>
<td>26,220 ± 550</td>
<td>AA-32669</td>
<td>Charcoal</td>
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</table>
(upper part of layer 11) (Table 1; Derevianko et al., 2005b, 2008), document the site’s potential for future research.

The $^{14}$C record of the MP and EUP complexes at Denisova Cave is still poor, with a few $^{14}$C measurements obtained from the site’s profiles. In the cave entrance area, the MP layer 9 is dated to 46,000 ± 2300 $^{14}$C BP (GX-17602) using charcoal, but no $^{14}$C dates are available for the EUP complex. In the main chamber of the cave, the MP layers lack $^{14}$C age determinations, while the age of animal bone from the EUP layer 11.4 was determined as >37,235 $^{14}$C BP (Table 1). Two $^{14}$C dates from the eastern gallery related to the EUP complex have been mentioned above.

Mammal remains from Denisova Cave are plentiful (Derevianko et al., 2003: 178–234). The MP layers of the entrance (layer 9) and main chamber (layers 13–12) contain red fox (Vulpes vulpes, V. corsac), polar fox (Alopex lagopus), gray wolf (Canis lupus), cave bear (Ursus rossicus), cave hyena, mammoth, woolly rhinoceros, yak (Poephagus mutus), Mongolian gazelle (Procapra gutturosa), saiga (Saiga tatarica), horses (Equus hydruntinus & E. ferus), roe deer (Capreolus pygargus), red deer, ibex, bison, and wild sheep. The most numerous species are bears, gray wolf, cave hyena, horse, bison, and wild sheep. In the EUP layers (layers 8 and 7 in the entrance area and layers 9 and 11 in main chamber), red fox, polar fox, gray wolf, sable (Martes zibellina), cave hyena, brown bear (Ursus arctos), cave bear, cave lion, woolly mammoth, woolly rhinoceros, horse, roe deer, red deer, bison, Mongolian gazelle, yak, ibex, saiga, and wild sheep were found. Among them, horse, ibex, bison, wild sheep, and cave hyena dominate. Besides mammals, bird and fish bones were identified in the MP and EUP layers. Micromammal composition allows environmental reconstruction of the latest MP layers as cold and dry steppes, and of the EUP layers as cold steppes.

Palynological data provide the opportunity to reconstruct human environment at the end of the MP and during the EUP at Denisova Cave. The latest MP layers were formed under a cool and dry climate, with the presence of conifer forests and steppes. The EUP complexes appear in landscapes of dark conifer forests with open spaces covered with meadows, with forests decreasing through time, culminating in the climatic conditions of layer 9 (main chamber) which were the coldest and driest.

Studies of Strashnaya Cave are still preliminary (e.g., Derevianko et al., 1998a: 86–87, 157–159). Here the MP layers with Levlois flakes and points are $^{14}$C-dated to 25,000 $^{14}$C BP (SOAN-785) and to 31,510 ± 2615 $^{14}$C BP (SOAN-3219), both run on bone (Kuzmin and Orlova, 1998; Vasil’ev et al., 2002). The association of the SOAN-785 sample with a particular cultural layer is hampered by the wide depth range from where the bulk sample was taken, from 3 to 4 m below surface (e.g., Vasil’ev et al., 2002: 521). Also, in the original report the cultural attribution is given as “Mousterian–Upper Paleolithic” (Orlova, 1995: 208). In light of newly obtained $^{14}$C dates of ca. 35,000 $^{14}$C BP and even older from the EUP layers (A. N. Zenin, pers. comm. 2007), the SOAN-3219 date initially determined as from the MP layer 5 (Derevianko and Zenin, 1997) could now be associated with the EUP. Unfortunately, no $^{14}$C dates from the EUP layers were officially released at the time of writing this review. Taking into account recent finds of adornments (two bone pendants) in a layer that provided a “transitional” industrial industry at Strashnaya Cave (Zenin and Kandyba, 2006), it is essential to receive more chronometric determinations for both MP and EUP cultural complexes at this locality.

**Transbaikal [Zabaikal]**

East of Lake Baikal, Khotyk 3 has yielded evidence of both MP and EUP occupations (Lbova, 2000, 2002; Lbova et al., 2003). Layers 6 and 5 contain MP assemblages and layer 4 is of “transitional” character; layers 3 and 2 belong to the EUP (Lbova, 2002). From the MP layers, two $^{14}$C dates were recently obtained on animal bone resulting in an age of 38,700 $^{14}$C BP (AA-60614) for layer 5/2, and 35,100 ± 1500 $^{14}$C BP (AA-60613) for layer 4. The EUP layers yielded the following $^{14}$C ages on bone: ca. 38,200 $^{14}$C BP and ca. 32,700 $^{14}$C BP for layers 3 and 2, respectively (Table 1) (Kuzmin et al., 2006). Previously, $^{14}$C bone dates were obtained from cultural layers 3 (ca. 32,120 $^{14}$C BP and ca. 29,310 $^{14}$C BP) and 2 (ca. 28,770 $^{14}$C BP) (Table 1). A radiocarbon date
of ca. 26,220 $^{14}$C BP was generated for cultural layer 2 (Table 1; Lbova et al., 2003). The explanation of the age inversion of layers 4 and 3 may be due to any of the following factors: relocation of bones by post-depositional cryogenic activity; burrowing by animals; and site disturbance during digging of pits from layer 2 downwards (Kuzmin et al., 2006). The finding of non-utilitarian objects in the EUP cultural layers 2 and 3, bone and stone beads and rings as well as pigment (Lbova et al., 2003: 85; Derevianko and Rybin, 2003), is important as evidence of symbolic behavior. The provisional boundary between the MP and EUP assemblages of the Khotyk 3 may be established as ca. 38,000 $^{14}$C BP (Kuzmin et al., 2006).

Mammal remains from the MP cultural layers 5 and 4 belong to woolly rhinoceros, horse (Equus sp.), bison, Mongolian gazelle, and wild sheep. In the EUP layers 3 and 2 bones of woolly rhinoceros, horse, red deer, roe deer, bison, wild sheep, and Mongolian gazelle were identified (Klementiev, 2005). Paleoenvironmental data show that MP cultural layers 5–4 were formed under dry steppic and semi-desert conditions; EUP layer 3 – in deteriorating conditions from steppes in the beginning to dry steppes and semi-deserts at the end, and EUP layer 2 – in forest steppes (Lbova et al., 2003: 171–172).

Other Siberian sites

There are some sites in southern Siberia with suggested MP and EUP cultural complexes in stratigraphic order: Dvuglazka, Kurtak 4, and Arta 2 (Fig. 1). However, they are quite obscure in terms of their cultural attribution, and are mentioned only briefly.

The Dvuglazka rockshelter in the foothills of Kuznetsky Alatau Mountains is well-known (e.g., Derevianko et al., 1998a: 118, 200). The MP layer 7 has produced a $^{14}$C date on bone of 27,200 ± 800 $^{14}$C BP (LE-4811), and UP level 4 was $^{14}$C-dated to 26,580 ± 520 $^{14}$C BP using bone (LE-4808; e.g., Vasil’ev et al., 2002). Also, there is a bone $^{14}$C value of 22,500 ± 600 $^{14}$C BP (LE-1433) from an unidentified context. The blade technology is typical for the cultural layer 4 at Dvuglazka ( Lisitsyn and Svezhentsev, 1997: 87); however, a few artifacts, including prismatic cores and an ornamented bone polisher were found in this layer. Based on such scanty data, it is hard to understand the nature of the MP-EUP transition at this site. Also, the use of the Dvuglazka as a hyena den (C. G. Turner II, pers. comm. 2004) throws into questions the stratigraphic integrity of the site.

In cultural layer 17 at Kurtak 4 in the Upper Yenisei River basin a few Moustierian-looking artifacts were found: six flakes, two Levallois points, three large pebble-choppers, one core with negatives of blade flaking, and broken pebbles (Lisitsyn, 2000: 19–20). Associated mammal finds were represented by woolly rhinoceros, bison, horse (Equus caballus), and giant deer (Megaloceros giganteus). Two $^{14}$C values were obtained from this complex: an animal bone dated to 32,380 ± 280 $^{14}$C BP (LE-3638), and a charcoal date of 31,650 ± 520 $^{14}$C BP (LE-3352). The EUP cultural layers 12–11 provided a $^{14}$C date on charcoal of 27,470 ± 200 $^{14}$C BP (LE-2833; Svezhentsev et al., 1992).

The data of Arta 2 in the Transbaikal region are published in preliminary form only (Kirillov and Kasparov, 1990). The MP layer at the base of the sequence produced a $^{14}$C date on charcoal of 37,360 ± 2000 $^{14}$C BP (LE-2967). The mammalian fauna is represented by mammoth, woolly rhinoceros, cave hyena, bison, and cave lion. Artifacts are not numerous; two Levallois-like blades and a single chopper-like tool were found. The upper part of the sequence contains a UP assemblage with a charcoal $^{14}$C date for layer 3 of 23,200 ± 2000 $^{14}$C BP (LE-2966). The faunal material belongs to bison, woolly rhinoceros, horse, cave hyena, saiga, and rodents. Judging from very brief description of artifacts without drawings, it is impossible to derive any reliable conclusion about the nature of the Middle to Upper Paleolithic transition at this site.

DISCUSSION

The available $^{14}$C records for MP and EUP sites in Siberia show that the latest MP assemblages may be dated to ca. 30,000–27,000 $^{14}$C BP, while the earliest EUP complexes appeared by at least ca. 43,000 $^{14}$C BP (e.g., Kuzmin, 2004), and possibly even earlier if we take into account the $^{14}$C value of ca. 48,700 $^{14}$C BP for layer 11 of the eastern gallery at Denisova Cave (Derevianko et al., 2003: 171–172). The stratigraphic integrity of the site is questioned by the finding of modular objects, bone beads and rings as well as pigment (Lbova et al., 2003: 85; Derevianko and Rybin, 2003), which are important as evidence of symbolic behavior.
The environment of the MP-EUP transition corresponds in Siberia to the Karginian [Karginsky] interstadial that correlates with Oxygen Isotope Stage 3. Climatic conditions at that time were unstable, with several cold and warm stages, but in general cooler than today (Arkhipov et al., 2005b). The long-term coexistence of MP and EUP complexes in Siberia is therefore evident. The same feature is currently observed in Europe. The latest Neanderthals at Vindija Cave (Croatia) are now directly 14C-dated to 31,390 ± 220 14C BP (OxA-9663; Higham et al., 2006), compared with a previous 14C measurement of 28,020 ± 360 14C BP (OxA-8295; Smith et al., 1999). The Mousterian cultural layers at Gorham’s Cave (Gibraltar, Iberian Peninsula) are dated to ca. 32,600–28,400 14C BP and perhaps as young as ca. 24,000 14C BP (Finlayson et al., 2006). The existence of “pockets” of late Mousterian assemblages at the time of EUP and modern humans appearance in Europe is now widely accepted (e.g., Bar-Yosef et al., 2006: 57, fig. 6).

The very early age of the EUP complexes in Siberia, especially at Kara-Bom with the full EUP “package” (volumetric flaking, blade tools, scrapers, chisel-like burins, and objects of personal adornment) dated to ca. 43,000 14C BP, should be taken into account when the origin of the EUP in Eurasia is considered. The in situ position of the Kara-Bom EUP assemblages overrules some skepticism about the undisturbed nature of this site (Bar-Yosef, 2002: 372). From the viewpoint of 14C dating, the Kara-Bom date of 43,200 ± 1500 14C BP is statistically identical to the most reliable value of 46,930 ± 2420 14C BP (SMU-259; e.g., Phillips, 1994) for the earliest Ahmarian complex at Boker Tachtit. “Calibrated” ages for these sites (CalPal program, QuickCal 1.3.1. option; 68% range) are: 50,405–46,405 cal BP for Boker Tachtit, and 48,094–44,501 cal BP for Kara-Bom (see also Kuzmin, 2007b: 762).

In Turkey and Europe, the oldest EUP complexes have been 14C-dated to ca. 41,400–38,900 14C BP at Uçagızlı Cave in southeast Turkey (e.g., Kuhn et al., 2001); ca. 41,700–39,500 14C BP at Willendorf II, layers 2 and 2/3; ca. 41,300 14C BP at Stránská skála IIIa (e.g., Tostevin and Škrďla, 2006); and ca. 40,200–37,300 14C BP at Geißenklösterle (Conard and Bolus, 2003), all in Central Europe; and to ca. 37,200–35,300 14C BP at Kostienki (Anikovich et al., 2007) and ca. 36,600 14C BP at Mamontovaya Kurya (Pavlov et al., 2004).
both on the Russian Plain. Therefore, if the Kara Bom $^{14}$C dates are contemporaneous with the Levantine complexes (Boker Tachtit) and are older than any EUP-associated $^{14}$C dates from sites in Europe, this may mean that the very early EUP of the Altai region reflects either the very quick spread of EUP from the Levant to Siberia as it was suggested by Bar-Yosef (2002: 372) and Goebel (2002: 108), or – more likely – the independent origin of the EUP in Siberia from regional MP complexes (Derevianko et al., 2000; Rybin, 2005: 85; Rybin, 2006: 329). In any event, the Siberian EUP record provokes substantial revision of existing models of the Middle to Upper Paleolithic transition and the origin of the EUP in Eurasia (e.g. Bar-Yosef, 2002; Dolukhanov et al., 2002; Mellars, 2006a, 2006b).

The link between lithic assemblages and modern humans in Siberia at the end of the MP and of the beginning of the EUP is still unclear. A few human remains correspond to the late MP, but there are no well-identifiable human fossils yet associated with EUP sites. The species interpretation for human teeth from the MP complexes of Okladnikov and Denisova caves is that they belong to early modern humans (Derevianko and Shpakova, 2000; Shpakova, 2001), although they were initially associated with Neandertals (Turner, 1990: 241–242). The human DNA data from Okladnikov Cave support Turner’s (1990) determination as Neanderthals (Krause et al., 2008). In this situation, taking into account the late survival of MP cultural traits in Siberia, it is possible to assume that modern humans manufactured at least some of the Mousterian assemblages. The strict association of the MP of Siberia with Neandertals only, as was suggested by Pettitt (1999a, 1999b; Pettitt et al., 2000), now appears to be too simplistic an assumption.

**CONCLUSION**

Based on current data, it is possible to reveal major spatial-temporal patterns of the MP to EUP change in Siberia. This transition was a long process of coexistence of both MP and EUP cultural entities, at least between ca. 43,000 $^{14}$C BP and ca. 30,000 $^{14}$C BP in predominantly cool climatic conditions, interrupted with some milder ameliorations. MP assemblages persisted into the period when EUP complexes appeared all over Siberia, and this situation seems to be similar to that found in many other regions of Eurasia where the latest MP and EUP sites co-occur. The oldest EUP complex in Siberia at Kara-Bom may date as old as ca. 43,000 $^{14}$C BP. In the Transbaikal region, the MP-EUP transition can be provisionally placed at around 38,000 $^{14}$C BP. The very early EUP complexes with evidences of symbolic behavior, $^{14}$C-dated to ca. 43,000–30,000 $^{14}$C BP, make Siberia an important region for understanding the origin and spread of modern humans throughout the Old World. It is obvious that more chronometric data are needed for the Siberian MP and EUP, especially for the Altai Mountains area where rich EUP assemblages with non-utilitarian artifacts can shed new light on the origin of the Upper Paleolithic and modern human behavior.

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