Early Upper Paleolithic Settlement at Kostenki, Russia

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Abstract

During July-August 2008, field research was conducted at the Kostenki-Borshchevo sites, which are located on the Don River in Russia, and contain occupation levels and human skeletal remains that date to the Upper Paleolithic. Although these sites are famous for their middle and late Upper Paleolithic remains, which include complex features and figurative art, the focus of the 2008 research was the early Upper Paleolithic or EUP (roughly 45,000-30,000 cal years BP). The 2008 work represented the latest phase of an international research program that began in 2001; a grant from NGS provided critical support when NSF funds for 2007-2008 fell short owing to a fall in the US dollar and rise in Russian prices.

At the Kostenki-Borshchevo sites, EUP levels are buried in a slope and spring deposits that are subdivided by a dated volcanic tephra (40,000 years BP), which provides a chrono-stratigraphic marker for the archaeological layers. In 2008, new excavations were undertaken at Kostenki 1, Kostenki 8 (*Tel'manskaya*), Kostenki 14 (*Markina gora*), and Borshchevo 5. At each site, the EUP levels yielded new artifacts, features, and faunal remains; the senior author did some additional work on large mammal remains from EUP layers at Kostenki 14 and 15 in St-Petersburg during April 2009. The 2008-2009 research contributed to an emerging picture of the "EUP landscape" at Kostenki.

Background and Research Objectives

The Kostenki-Borshchevo sites are located on the west bank of the Don River 40 km southwest of the city of Voronezh. In this region, the Don flows along the eastern margin of the Central Russian Upland, which is primarily composed of Cretaceous limestone and rests up to 100 meters above the modern river level. Upper Paleolithic open-air sites are found in fill of the first and second terraces. These terraces are preserved along the main valley and also extend up several large ravines incised into the high west bank of the valley in the vicinity of the villages of Kostenki and Borshchevo (Klein 1969; Velichko 1961). Most of the archaeological sites are found at the mouths, or along the upper reaches, of these large side-valley ravines, which today—as in the past—contain active springs (Holliday et al. 2007).

EUP occupation layers are buried in a sequence of loam, calcareous rubble, and organic-rich layers that overlie alluvium of the second terrace (15-20 meters above the present level of the Don River). At many sites, layers of loam and organic-rich sediment are inter-bedded with bands of calcium carbonate (Holliday et al. 2007). These deposits have traditionally been assigned to the *Upper Humic Bed* and the *Lower Humic Bed*, which are subdivided by a volcanic tephra horizon (e.g., Lazukov 1982; Pyle et al. 2006; Anikovich et al. 2007).

Pleistocene large mammal remains have been turning up at Kostenki for more than two hundred years, but evidence of Paleolithic occupation was first recognized in 1879 (Klein 1969). During the late 19th century and the first half of the 20th century, investigation was primarily focused on the large Gravettian settlement at Kostenki 1 (Efimenko 1958). During the years following the Second World War, the late A. N. Rogachev uncovered many stratified occupation levels of EUP age (see Praslov and Rogachev 1982) and Kostenki became a major source of information on this critical period of prehistory.

Figure 1. Topographic setting of Kostenki 1 (indicated by arrow) on the north side of Pokrovskii Ravine, which empties into the Don Valley.

The 2008 research at Kostenki-Borshchevo represented part of an interdisciplinary Russian-American project initiated with NSF and Leakey Foundation support in 2001-2004. In 2007, the project resumed with new grants from NSF and the Leakey Foundation and some support from the Russian Academy of Sciences. Field research costs exceeded expectations in 2007-2008 due to a simultaneous fall in the US dollar and rise in Russian prices. A 2008 grant from NGS addressed the shortfall and ensured that the excavations and analyses planned for 2008 would be undertaken.

From the outset, the interdisciplinary Russian-American project at Kostenki-Borshchevo has been focused on the study of the EUP. During the 2001-2004 phase of the project, the emphasis was on the earliest traces of Upper Paleolithic occupation, which are buried in sediments that underlie the volcanic ash—

recently identified at the Campanian Ignimbrite (CI) tephra, deposited at 40,000 cal years BP (Pyle et al. 2006; Hoffecker et al. 2008) (see Figure 2). The occupation layers below the CI tephra appear to date to as much as 45,000-44,000 cal years BP (Anikovich et al. 2007) and represent the oldest known Upper Paleolithic occupations in Eastern Europe. The artifact assemblages from these levels comprise typical Upper Paleolithic forms (burins, end-scrapers, bone awls, etc..) and at Kostenki 14 (Layer IVb), they included an ivory carving that may represent the head of a human figurine and perforated shells imported more than 500 km from their source (Anikovich et al. 2007: 225). They are similar in many respects to contemporaneous EUP assemblages in Southeastern Europe often labeled "Proto-Aurignacian" (Hoffecker 2009a).

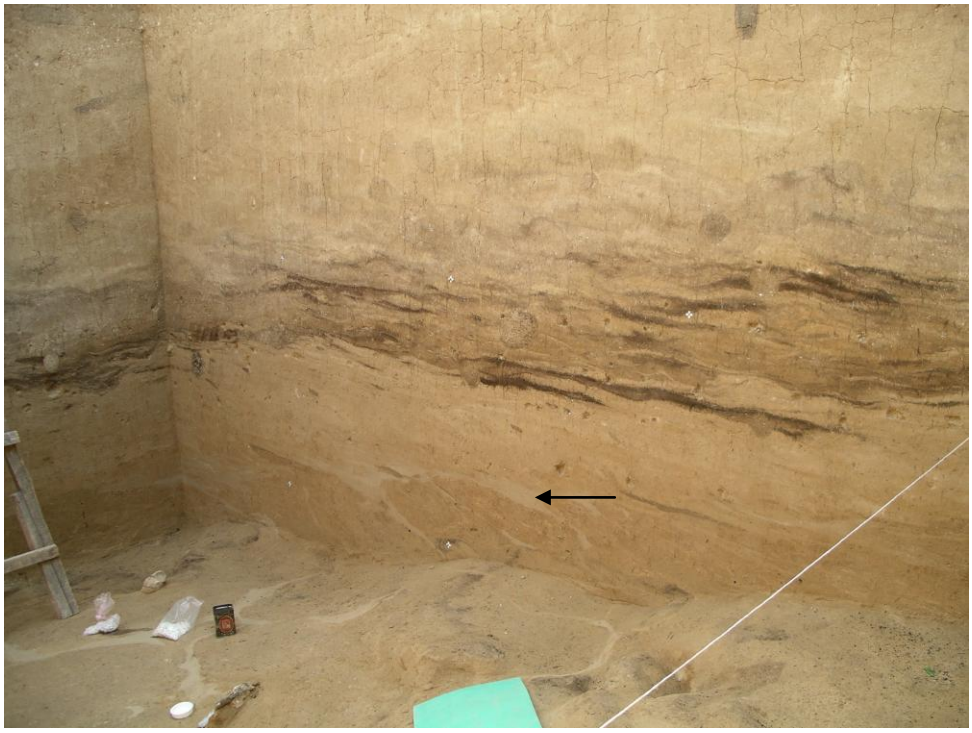

Figure 2. Borshchevo 5: south wall of 2008 excavations, showing Upper Humic Bed and underlying CI tephra (indicated by arrow). Isolated horse bones and artifacts of EUP Layer III are exposed on the floor of the unit.

The 2001-2004 phase of the project also reflected a strong emphasis on geoarchaeology—not only problems of stratigraphy and geochronology, but also questions concerning site formation processes. The latter were complex at the Kostenki-Borshchevo sites, especially during EUP times, and involved an interplay of slope action, spring activity (also common today), soil weathering, and other factors (Holliday et al. 2007). Analysis of the soil micromorphology during 2001-2004 revealed the importance of springs and seeps in creating the humic beds, which are deposited both above and below the CI tephra and

contain many EUP occupation horizons; this remains one of the most significant results of the Russian-American interdisciplinary project to date.

During 2007-2008, the primary focus of the project shifted to the younger EUP occupations. These levels are buried in the Upper Humic Bed (and its stratigraphic equivalent), which overlies the CI tephra, but underlies the loess-like loams that were deposited at the beginning of the Late Pleniglacial. They date to between 40,000 cal years BP (i.e., age of the CI tephra) and the end of the Middle Pleniglacial or roughly 30,000-28,000 cal years BP. Occupations of this age have been identified at many Kostenki-Borshchevo sites on the second terrace level above the Don River, including Kostenki 1, 8, 12, 14, 15, 16, 17, and Borshchevo 5, and they have yielded a substantial body of data in terms of stone and non-stone artifacts, complex features, and vertebrate faunal remains. At Kostenki 1, the Upper Humic Bed is absent and the EUP occupation dating to this period (Layer III) is contained within and below a buried soil (b2) that is similar to the *Bryansk Soil* of the Desna Valley region (Velichko 1961; Holliday et al. 2007).

As during previous years, field research in 2008 was undertaken within the framework of a set of defined problems concerning the early settlement of the central East European Plain by anatomically modern humans. When did this settlement begin and under what circumstances in terms of climate and local environmental conditions? What was the relationship between the EUP occupants of Kostenki-Borshchevo (assumed to be modern human) and the earlier Neanderthal inhabitants of the East European Plain (who may have abandoned the region prior to the appearance of modern humans)? Was the EUP characterized by significant changes in diet and economy in comparison to the Neanderthals? Did significant changes take place during the course of the EUP (e.g., major technological innovations, changes in diet and/or subsistence practices) that anticipated the large settlements of the middle Upper Paleolithic both on the central plain of Eastern Europe and other parts of the continent?

Analyses of faunal remains from several EUP occupations in 2004-2005 and 2007-2008 revealed evidence of large mammal kill-butchery events involving horse, reindeer, and mammoth (Hoffecker et al. 2005; Hoffecker 2009a). This suggested some significant functional variability among the EUP sites at Kostenki-Borshchevo—which also contain some large habitation areas—that might account for differences in artifact assemblage variability (previously attributed to cultural traditions). Collectively, the sites seem to represent an "EUP landscape" over which people moved and camped, performing a variety of activities, between 45,000 and 30,000 years ago. An analogy may be found in the "Clovis landscape" reconstructed for Paleoindian sites in the San Pedro Valley in southern Arizona (Haynes and Huckell 2007).

Field Research 2008

During July-August 2008, excavations were undertaken at four sites: Kostenki 1, Kostenki 8 (*Tel'manskaya*), Kostenki 14 (*Markina gora*), and Borshchevo 5. Excavations at each site were directed by specific team members who had conducted fieldwork at the site in previous years. Rotating excavation crews comprising undergraduate and graduate students from Saint Petersburg State University and Voronezh University began work on 1 July and completed backfilling of excavated units by 31 August. Two graduate students from Cambridge University participated in the excavations during July and early August, and sampled for plant remains from EUP levels at Kostenki 8 with the use of flotation. The senior author (Hoffecker) was present in the field during 2 – 24 August to collect sediment samples for soil micromorphology, traces of volcanic tephra, and new OSL dates, as well as to collect data on the large mammal remains recovered from Layer V or Kostenki 1. The second author (Holliday) was present during 12 – 24 August collecting samples and data on issues of stratigraphy, site formation processes, and geochronology. Additional work on zooarchaeology was undertaken by Elena Syromyatnikova (Zoological Institute, Russian Academy of Sciences) during 12 – 23 August.

Kostenki 1 (*Polyakov's Site*). The site of the original 1879 discovery remains an important focus of research, including research on the EUP, although the stratigraphy now appears anomalous. Located on the north side—near the mouth—of a large ravine (*Pokrovskii Ravine*) in the northern portion of the village, Kostenki 1 was investigated by the Russian-American interdisciplinary project in 2004, and was subject to limited field study in 2005-2006 focused on the western periphery of the site. In this area, excavations in 2004-2006 revealed that middle-late Upper Paleolithic remains were scarce, but EUP occupation levels were comparatively well represented by artifacts and faunal remains. In 2007, a 46-m^2 excavation block was opened up in this area and artifacts and faunal materials were recovered from EUP occupation levels in Layers III, IV and V—including bones and teeth from Layer V that appear to represent butchery of a single adult mammoth.

Under the direction of M.V. Anikovich with the assistance of A.E. Dudin, an area of 24 m^2 (4 x 6 meters) was exposed during July-August 2008. This excavation block was located on the western portion of Kostenki 1, but adjoining early excavations near the center of the site undertaken in 1931-1936. Only isolated materials were encountered in the uppermost post-EUP levels (Layers I and II) in the larger excavation unit. However, EUP Layer III yielded a major feature occupying an area of more than 4 x 4 meters and comprising a mass of large mammal bones—primarily mammoth but also some horse. Isolated artifacts, including one large hammerstone, were associated with the mammal bones in this layer (see Figure 3). A *sondage* (1 x 4 meters) excavated at the north end of the unit did not encounter any materials in levels below Layer III.

In earlier years, Layer III produced an assemblage containing diagnostic Aurignacian forms, and is widely recognized as the most typical such assemblage in Eastern Europe. More recently, however, this level has also yielded artifacts typical of the East European Streletskaya culture, characterized by a high percentage of Middle Paleolithic tool types (often manufactured on low quality local raw material). The feature uncovered in 2008 reinforced a pattern observed at other Kostenki EUP occupations—that these artifacts are consistently associated with probable traces of large-mammal butchery (Hoffecker 2009a).

Figure 3. Kostenki 1, Layer III feature comprising large mammal bones exposed during 2008 excavations.

Figure 4. Kostenki 1, Layer V mammoth ulna with apparent cut marks excavated in 2006 and examined in 2008.

During August 2008, Hoffecker and Holliday collected sediment samples for soil micromorphology analysis, as well as OSL dating, from several layers in Kostenki 1. Samples also were collected for the microscopic analysis of traces of volcanic tephra (not visible to the unaided eye in most areas of Kostenki 1). Analysis of the latter by Brian J. Carter (University of Oklahoma) yielded diffuse concentrations of glass shards in a zone underlying Layer III. The soil micromorphology samples were prepared as thin sections at the University of Arizona and have been shipped to Paul Goldberg (Boston University) for analysis. The OSL samples have been sent to Steven L. Forman (University of Illinois-Chicago). The collection and analysis of sediment samples is designed to help resolve continuing uncertainties regarding the stratigraphy and dating of the lower EUP levels—it is unclear whether Layers IV and V antedate or postdate the CI tephra and 40,000 cal BP.

Hoffecker also collected taphonomic information on mammoth bones excavated from Kostenki 1, Layer V in 2006-2007 and stored at the site. The analysis of the 2006-2007 mammoth remains from Layer V yielded additional information

on the suspected mammoth butchery locus at the site—which is unique to the EUP of Eurasia (see Figure 4).

A smaller unit (2 x 3 meters) was excavated on the extreme western margin of Kostenki 1. This unit did not yield any artifacts or faunal remains, but provided information on the stratigraphy at the western margin of the site and a profile was recorded by Holliday and Hoffecker.

Kostenki 8 (*Tel'manskaya*). For the first time in many years, new excavations were undertaken in 2007 at this major EUP site. Kostenki 8 is located near the mouth of a ravine (*Aleksandrovka*) located roughly two kilometers south of Pokrovskii Ravine. A 2 x 3 meter unit was excavated into a previously undisturbed area at the site in 2007, yielding a typical set of wall profiles for Kostenki 8 and several hundred artifacts and faunal remains from Layers I-III (Layers II and III are buried in the Upper Humic Bed and date to the later EUP).

In 2008, a 15-m^2 excavation block (5 x 3 meters) was opened up in an area adjoining the eastern wall of the 2007 test trench under the direction of V. V. Popov. Several hundred artifacts and associated medium and large mammal remains were recovered from Layers II-III (which are difficult to differentiate and may represent one thick zone of occupation comparable to Layer III at Kostenki 1). The stone artifacts included microblades. The occupation floor is unique to the EUP at Kostenki and comprises a dense concentration of occupation debris in sediment saturated with red ochre and charcoal (see Figure 5). Both the artifact assemblage(s) and occupation floor are similar to those of the middle Upper Paleolithic (Eastern Gravettian) and may reflect changes in society and economy at the end of the EUP that anticipate the Gravettian.

Figure 5. Kostenki 8: 5 x 3 meter excavation unit excavated in 2008 showing Layer II/III occupation floor (late EUP).

Figure 6. Kostenki 14, Layer IVa excavation in late August 2008.

Hoffecker and Holliday collected sediment samples from the Layer II/III occupation floor for soil micromorphology analysis and recorded a detailed stratigraphic profile from the east wall of the 2008 excavation unit. Several previously unreported buried soil horizons may be present at Kostenki 8. Wood charcoal samples for radiocarbon dating also were collected (and have been submitted to the University of Arizona accelerator laboratory). Flotation of sediment samples from Layer II/III for the recovery of plant remains also was performed in the field in 2008, and G. M. Levkovskaya (Institute of the History of Material Culture, Russian Academy of Sciences) collected samples for pollen/spore analysis.

Kostenki 14 (*Markina gora*) is located on the second terrace level on the south side of Pokrovskii Ravine, roughly one kilometer upstream from the ravine mouth and Kostenki 1. The stratigraphy exhibits a classic Upper Humic Bed profile and volcanic tephra horizon and has been extensively dated with radiocarbon and OSL (Sinitsyn and Hoffecker 2006; Holliday et al. 2007). Kostenki 14 has yielded some of the best known EUP assemblages in Eastern Europe and these include Layer II and Layer III in the Upper Humic Bed.

In July-August 2008, an excavation block of more than 20 m^2 was opened up under the direction of A. A. Sinitsyn. Artifacts and faunal remains were recovered from Layer I (middle Upper Paleolithic) and Layers II-III (later EUP), and Layer IVa (early EUP underlying the CI tephra). A new EUP horizon containing materials apparently redeposited by slope action was identified; this horizon, which yielded a bifacial point, has been tentatively linked to Layer IVa.

Much of the new material recovered during 2008 was from Layer IVa, including more than 500 stone artifacts (10 cores and roughly 20 retouched pieces) and a large quantity of mammal bones (primarily horse [*Equus latipes*]). The 2008 excavation increased the total excavated area of this layer to 120 m^2, which is unprecedented for EUP occupations below the CI tephra. Layer IVa may represent a horse kill-butchery location (with associated habitation area) analogous to Layer II (late EUP) excavated by Rogachev in the 1950s. A minimum of 60 individual horses have now been recovered from this level since 2001.

In 2008, portions of a mammoth skeleton were excavated from an archaeologically sterile layer that underlies Layer IVa. In 2002 and 2005, the skull and other skeletal parts—apparently from the same individual mammoth—were excavated from this layer. No artifacts have been found in this layer, nor is there any other evidence (e.g., cut marks on the bones) of human activity related to these remains. Also, Sinitsyn collected new samples for radiocarbon dating, which have been submitted to several laboratories in Europe.

Kostenki 17 (*Spitsynskaya*). For the first time since 1980, new field investigations were conducted at this major EUP site, which remains the type locality for

the Spitsynskaya culture (Klein 1969; Praslov and Rogachev 1982: 181-186). Unlike most of the Upper Paleolithic sites at Kostenki-Borshchevo, Kostenki 17 is located in the main valley, downstream from the mouth of Pokrovskii Ravine on the second terrace level.

Access to the area excavated in 1953-1955, 1963, and 1980 was precluded by current land use, and field research was confined to an area north of the original excavations that did not yield any artifacts. However, the primary object of the 2008 investigations was new information on stratigraphy. A profile pit measuring 3.7 x 2.9 meters (to a depth of more than 6 meters) was excavated by members of the Kostenki 14 crew; the stratigraphy was recorded in detail, sediment samples collected (for soil micromorphology analysis), and extensive photographs were taken by Holliday and Hoffecker. The most significant finding was the identification of a previously unreported buried soil horizon in the upper part of the profile that appears similar to the b2 (or Bryansk Soil) at Kostenki 1.

Figure 7. Kostenki 17: V.T. Holliday standing in stratigraphic profile pit (showing east and south walls). Buried soil indicated by arrow.

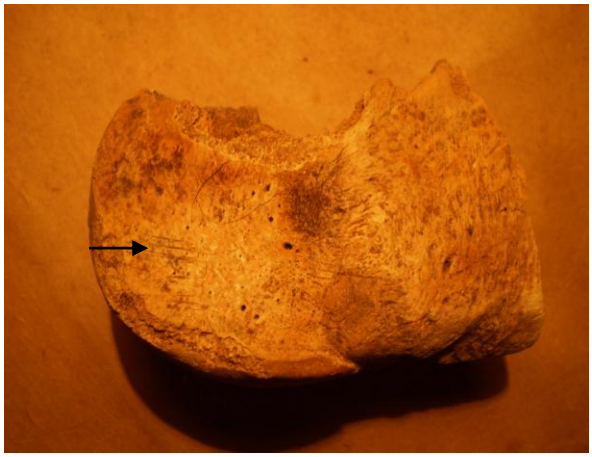

Figure 8. Kostenki 14, Layer II: horse distal humerus (*Equus latipes*) exhibiting stone tool cut-marks.

Borshchevo 5. The village of Borshchevo is located on the west bank of the Don River roughly six kilometers southeast of Kostenki. Like the Kostenki sites containing EUP occupations, Borshchevo 5 is found on the second terrace level of a large ravine that contains an active spring. Discovered in 1998 and initially excavated in 2002-2004, new work was in 2007 undertaken by S. N. Lisitsyn with a small crew. Approximately 20 m^2 was exposed and artifacts and faunal remains were recovered from Layer I (Gravettian), Layer II (late EUP in the Upper Humic Bed), and Layer III (lying within and below the CI tephra, which is relatively thick and unweathered here) (see Figure 2).

In July-August 2008, Lisitsyn opened up a 25-m^2 excavation block and re-covered isolated artifacts and large mammal bones (primarily horse) from EUP Layer III. The horse bones include some articulated lower limb and foot bones,

which suggest some kill-butchery activity in this layer. A smaller unit (3 x 3 meters) was excavated in the western portion of the site, yielding several hundred artifacts from Layer I with associated large mammal bones. Hoffecker and Holliday collected sediment samples for soil micromorphology analysis from Layer III.

Zooarchaeology Research: April 2009

During April 2009, Hoffecker collected data on faunal remains excavated from late EUP levels by Rogachev during the 1950s at Kostenki 14 (Layer II) and Kostenki 15, and stored at the Zoological Institute in St. Petersburg. Each occupation layer yielded more than 1,000 identified bones and teeth of horse (*Equus latipes*). The visit was designed to supplement data collected in March 2008 from the same collections. As during the previous visit, taphonomic data, including represented skeletal parts, weathering, breakage patterns, carnivore damage, traces of tools, and other information were collected (see Figure 8). In 2009, crown-height measurements on the premolars and molars were taken for age determinations. Both Kostenki 14, Layer II and Kostenki 15 appear to represent kill-butchery events associated with habitation areas.

Conclusions

The results of the 2008 field research at Kostenki-Borshchevo, combined with supplemental data collection on large mammal remains (mammoth and horse) excavated during earlier years, contribute to an emerging picture of an "EUP landscape" in the area that provides important insights to a critical period in human prehistory. The open-air sites at Kostenki-Borshchevo offer a more complete view of EUP society and economy than the rockshelters of southwest Europe, which are confined to habitation sites for this period.

At Kostenki-Borshchevo, habitation areas—probably representing both short and long-term camps—are found along with locations where large mammals were killed and/or butchered. At some sites (e.g., Kostenki 14, Layer II), habitation areas seem to have been occupied in conjunction with a major kill-butchery event (analogous to the Paleoindian Murray Springs site in Arizona [Haynes and Huckell 2007]). At other locations (e.g., Borshchevo 5, Layer III), a kill-butchery event seems to have occurred without associated habitation (analogous to a number of Paleoindian sites in western North America). The pattern is evident in both the earlier EUP (i.e., antedating 40,000 cal BP) and later EUP (dating to ~40,000-30,000 cal BP). Most of the kill-butchery locations contain remains of horse, but reindeer and mammoth also are represented.

The differences in site function observed in the EUP layers at Kostenki-Borshchevo help explain the variations in artifact assemblages. These variations have traditionally been explained in cultural terms (e.g., Praslov and Rogachev 1982), following an interpretive framework derived from the Franco-Cantabrian region

of southwest Europe. From the perspective of the senior author, however, the variations in EUP artifact assemblages are more parsimoniously explained primarily in functional terms. Artifacts associated with kill-butchery locations consistently yield types found in Paleoindian large mammal kill-butchery sites (e.g., hammerstones, bifacial points, side-scrapers). In the EUP occupations at Kostenki-Borshchevo, these artifacts also appear to represent kill-butchery tool kits.

The EUP sequence at Kostenki-Borshchevo also yields evidence for changes through time, however. This is especially evident in the contrast between the layers above and below the CI tephra (~40,000 cal BP), which appears to mark a significant break in the EUP record for Eastern Europe. Many assemblages above the tephra appear similar to the contemporaneous Aurignacian industry of Western and Central Europe (Anikovich et al. 2007), whereas the occupation levels below the tephra contain materials that are generally similar to sites in Western and Central Europe often described as "Proto-Aurignacian" (Hoffecker et al. 2008; Hoffecker 2009a). Moreover, the later part of the EUP sequence—contained in the upper portion of the Upper Humic bed or its stratigraphic equivalent—indicates some changes in economy and settlement size that seem to anticipate the middle Upper Paleolithic (Gravettian). This pattern is best illustrated in Layer II/III at Kostenki 8.

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