Dispersal, Mating Systems, and Languages of Early Modern Humans in Northern Eurasia

P.M. DOLUKHANOV

University of Newcastle, U.K.

Abstract

The distribution of frequencies of radiocarbon-dated Upper Palaeolithic sites in Northern Eurasia shows three peaks culminating at 40-30, 24-18 and 17-11 ka BP. We view these peaks as reflecting three separate waves in the colonization of that area by Anatomically Modern Humans stemming from Africa and Western Asia. The waves of colonization, which included the Last Glacial Maximum, were caused by environmental stress which was particularly acute in the west, where the cooling and dryness of climate were the strongest. The expansion of mating networks aimed at the avoidance of inbreeding was the principle mechanism of migration. Populations of AMH spreading in the eastern direction during the second and third waves included 'softened' Mongoloid elements. Proto-Uralic and Proto-Altaic related languages are considered as the principle communication media of Early Modern Humans in Northern Eurasia.

Background

The problem of emergence and initial dispersal of anatomically modern humans (AMH) is now focused on several major issues: the single *versus* multiple origin; the coexistence of AMH with Neandertals; the chronology, trajectories, and casual mechanism of AMH dispersal. In this writer's view the 'Out of Africa' scenario remains the tenable explanation for the early spread of AMH. This scenario is in agreement with the evidence of mitachondrial DNA (mtDNA), according to which Africa was the likely source of the human mitochondrial gene pool 90,000-180,000 years ago (Cann et al. 1987). This concept is also corroborated by the finds of early forms of AMH in Africa, the most reliable being the partially preserved skeleton from Omo Lubish 1 Ethiopia. Taking into account the age of this specimen as well as less reliable finds, such as Klasies Cave, Border Cave, and Florisbad in South Africa, Guomeda (Kenia) and Jebel Irhoud (Marocco), the earliest presence of AMH on that continent is attributable to the Oxygen Isotope Stage 6, between 260 and 130 ka (Stringer 1998).

Recently obtained mtDNA evidence (Kivisild et al. 1999) suggests that India, the Caucasus, and Western Asia played a critical role in the further spread of AMH, both the western and eastern-specific haplogroups being found there. According to the 'molecular clocks', that entire area may have been settled by AMH as early as 70-60 ka. This age estimate is in agreement with the dates obtained for the remains of AMH in the Levant. The dating of 'primitive modern human burials' at Skhul and Qaszeh Caves in Israel yielded the age of 100-80 ka, i.e. within the range of the OIS 5 (Valladas et al. 1998; Stringer et al. 1989).

This leads one to the problem of coexistence of early AMH with the late Neandertals. In the Levant, the Neandertal burials were found at several cave-sites, which included the Tabun, Kebara, Amud, and Dederiyeh Caves. The date of 60 ka obtained for the Neandertal skeleton at the site of Kebara 2 suggests a prolonged temporal overlap of the both sub-species of *Homo* within a geographically restricted area (Stringer 1998). The earliest appearance of AMH in Europe is documented by the specimens with radiometric age of 32 - 30 ka (Smith et al. 1999). Existing radiometric dates firmly establish the occurence of Neandertal groups in France until ca 34 ka and ca 33 ka on the Iberian Peninsula. Recent AMS measurements for Neandertal mandibles at Vindija in Croatia (28-29 ka) provide the evidence for even later presence of Neandertal groups in that area of Europe (Smith et al. 1999).

Traditionally archaeologists linked up the emergence of AMH with the Upper Palaeolithic core-and blade technique, as exemplified by early Aurignacian assemblages dated in Bulgaria, Germany, and Spain to c. 40 ka. In view of recent observations, the association of AMH with this technique cannot be viewed as absolute. The blade manufacture is identified in several Lower and Middle Palaeolithic industries in Africa, Western Asia, and Europe. This became particularly obvious in the Near East, where the blade-dominated assemblages were found in various cultural contexts (Amudian, Pre-Aurignacian, and others) in the levels ranging between OIS 8 and 5 (Meignen 1998). The remains of both Neandertals and AMH at the time of their apparent coexistence in the Levant were found in the context of essentially similar industries, the 'Levantine Mousterian'. Both human subspecies shared broadly similar subsistence patterns and cultural features that included burial practices. One finds only minor distinctions in the mobility, resource acquisition strategies, and industrial subtypes (Lieberman 1998). In view of that, the Upper Palaeolithic phenomenon cannot be reduced exclusively to blade technology; this was a *complex package of socio-symbolic behavior*, the core-and-blade technology being but one of its attributes, and not an essential one.

Another debatable issue concerns the material manifestations of the alleged Neandertal-AMH cohabitation on the European continent. This problem directly relates to the interpretation of archaic UP industries identifiable in Europe for the time-span between 40 and 30 ka. These industries are known in France (Châtelperronian), Italy (Uluzzo), Central Europe (Szeletian and Buhunician), and Russia (Streletsian). They include archaic elements apparently inherited from the Mousterian tradition. The same industries attest a range of typically UP features, the tools manufactured on the blade blanks such as burins end-scrapers as well as tools and personal ornaments made of bone and antler. Based on the stratigraphic evidence of Saint-Césaire and Arcy-sur-Cure in France, the authorship of the Châtelperronian industry is ascribed to the Neandertal humans. Two hypotheses became crystallized in the ongoing debate. The first views the observed UP elements in the generally archaic industries as the product of contact, trade, interaction, and transfer of technology, resulting in the 'acculturation' of the Neandertals under the impact of AMH (Mellars 1999; Otte this volume). The second argues that this was an independent and autochthonous invention of local Neandertal groups (Errico et al. 1998).

The present article is aimed at the discussion of the chronology and mechanism of the initial dispersal of anatomically modern humans (AMH) in Northern Eurasia, as well as its social and linguistic implications with the predominant use of archaeological, palaeoenvironmental, and molecular genetic evidence, which came predominantly from European Russia and Siberia.

European Russia

Palaeoenvironment

The Middle Würm/Valdai 'megainterstadial' (OIS 3) in European Russia was a prolonged period of the cool and unstable climate. Arslanov (1992) has identified at least five such oscillations for the North-Eastern European Plain in the interval between 48 and 25 ka. During this period, three loess units interbedded by the 'Bryansk' and 'Trubchevsk' palaeosoils were formed in the periglacial area of the East European Plain. Based on the occurrence of Arctic fauna and cold-resistant plants, Morozova and Nechaev (1997) argue that the Dunaevo-Bryansk interval was generally cold and dry with more humid areas restricted to central Europe and southwestern areas of the East European Plain.

The quantitative assessment of climate is difficult, due to the absence of reliably dated sequences. The maps compiled by Frenzel et al. (1992) demonstrate mean August temperatures in Eastern Europe (30-60° E) during the 'megainterstadial' to be at least by 4 - 6° C lower than today, negative deviations of mean February temperatures from present-day values changing from 11° C in Scandinavia to 4° C in Southern Russia. Annual precipitation is estimated as 150-250 mm. Pollen data for the central part of the East European Plain (Semenenko et al. 1981) are suggestive of a lesser harshness of climate during that time-span.

The stage between 25 and 16.5 ka was the coldest; it included the Last Glacial Maximum (LGM), 20-18 ka., when ice sheets in Northern Eurasia reached their maximum extension. At this stage thick series of 'Loess II' were accumulated in the Central Russian Plain on top of the Bryansk palaeosoil (Velichko 1973). The analysis of cryogenic features suggests that the climate at that time was basically similar to that of present-day Yakutia in

Siberia: extremely cold and continental, with the common occurrence of permafrost, and the ground temperature in the order of -15-20° C (Velichko & Nechaev 1992). The quantitative assessment of LGM in European Russia (Tarasov et al. 1999) suggests a very strong round-the-year cooling with mean winter temperatures considerably lower than now: by 20-29° C in winter and 5 -10° C in summer. Annual precipitation was by 200- 450 mm less than today, with drought index showing particularly dry conditions in northern and mid-latitude Russia. The vegetation was dominated by the 'periglacial' tundra and the cold-resistant steppe in combination with an open woodland of larch and birch (Grichuk 1992).

The glacial recession at, 18 - 10 ka was the time of degradation of ice sheets, punctuated by short-lived glacial advances (Chebotareva & Makarycheva 1982). This coincided with the formation of the lower terraces in major river valleys and the accumulation of the 'Trubchevsk soil' and 'Loess III' (Velichko 1973). Large areas were affected by an intensive permafrost with the ground temperature of -3-5° C (Morozova & Nechaev 1997: 57).

Human Settlement

1. The Early Stage

Judging from the radiocarbon dates, the early stage in the spread of Upper Palaeolithic on the East European Plain occurred in the time-span of 35-40 ka (Sinitsyn et al. 1997). The sites were evenly scattered across the entire area; they are known in Western Ukraine, Moldavia, Crimea, Pontic Lowland, the Kostenki area on the River Don, in the Ural Mountains, and also in the extreme North-East, north of the Polar Circle.

Pollen analysis for early UP sites in the Kostenki area (Spiridonova 1991) has shown the fluctuating environment with the common occurrence of pine forests. As the climate grew colder, the spruce forest became increasingly dominant and the wider areas taken up by the cold-resistant 'periglacial' grassland. The wild horse (*Equus latipes*) was the principle hunting prey, its bones formed in the early Kostenki sites between 66.95 and 35.2 percent of the total faunal assemblage. The rate of the mammoth was 4-3 percent, and that of the reindeer, 2-1 percent.

In the cultural sense, the early UP sites belong to at least three traditions: Streletsian Aurignacian, and 'Protogravettian' (Sinitsyn et al. 1997: 42). The Streletsian inventories were initially identified at several of sites in the Kostenki area. Later, similar industries were found on the Severski Donets River in the Ukraine, in Central Russia (Sungir'), and also on the Kama River in the Urals (Bradley, Anikovich & Giria 1995). All these sites include the typical Mousterian side-scrapers and triangular bifacial points with concave basis. These archaic elements were combined with the typical Upper Palaeolithic tools. By contrast, both the Aurignacian, and 'Protogravettian' industries featured a fully developed Upper Palaeolithic 'core-and-blade' technique with a variety of tools manufactures on the blade blanks.

2. The Middle Stage

Frequencies of radiocarbon dated sites show a clear increase in the range of 29-26 ka. forming an all-time maximum at 24-18 ka (Figure 1). The sites of that stage were found mainly in the 'periglacial' East European Plain, in the area of an intensive accumulation of loess. (Gribchenko & Kurenkova 1997). Pollen records show (Spiridonova 1991) the climate getting much colder at that stage; the sites were normally found in a treeless landscape: the 'periglacial' grassland with rare cold-resistant shrubs restricted to deep ravines. At the Kostenki sites the faunal remains were dominated by the mammoth (60 percent), with the reindeer at 1.6 percent and the polar fox, 7 percent.

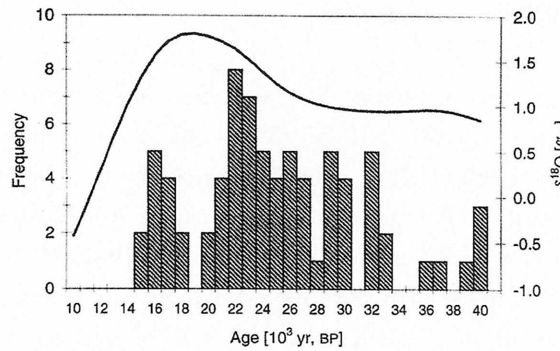

Figure 1. Frequencies of radiocarbon-dated sites. East European Plain.

Traditionally the sites belonging to this time-span in Eastern Europe were summarily labeled as the 'Eastern Gravettian.' Later studies have revealed a much more complex pattern. Using several stylistic criteria such as the 'shouldered points' and the dwelling structures, Russian archaeologists have identified the 'Kostenki-Avdeevo' Culture, which included also Khotylevo 2 and Zaraisk (Sinitsyn et al. 1997). Grigor'ev (1993) has recognized considerable similarities of these sites with those in Central Europe, notably, Willendorf, Predmosti, and Dolni Vestonice.

3. The Later Stage

The latest recognizable peak in the density of Palaeolithic sites occurred at 18-15 ka. This time-span corresponds to the retreat of the ice-sheet, with minor glacial advances. The sites belonging to that stage show a distinct spatial pattern, clearly oriented along the major waterways. Numerous sites arose in the basin of the Dnieper and, particularly, its tributaries, the Desna and Sudost'. The sites are also known in the basin of the Dniester, the Don (at Kostenki), as well as on the littoral of the Sea of Azov. At this stage the cultural fragmentation became apparent, each cultural unit being restricted to the river basin: the Prut-Dniestrian, Upper Dnieprian, Uralian etc. (Sinitsyn et al. 1997). The UP sites completely disappeared from the central area of the East European Plain with the beginning of the warm Alleröd Interstadial, ca. 11 ka.

Southern-Central Siberia

Palaeoenvironment

The time-span under discussion here, includes the Karginian Interval (50-22 ka) and the Sartan Glacial (22-10 ka) (Maloletko 1998). Frenzel et al. (1992) estimate the climate at that time as slightly colder than now, by 4° C in August and 6° C in February, with the annual precipitation lower than today by 80 - 50 mm. Macrofossils of arboreal plants in the lower stretches of the Yenisei River Valley dated to 30-25 ka, indicate the occurrence of forests in the high latitudes. The forest-type pollen spectra have also been identified in the presently treeless areas of the Altai Mountains, suggesting both temperature and precipitation exceeding the present-day values. Pollen spectra with the high participation of arboreal plants (mostly spruce and alder), combined with meadow and steppe herbs have been acknowledged in the Trans-Baikal area (Drozdov et al. 1995). The animal world consisted of large herd mammals and included the mammoth, woolly rhinoceros, wild horse, reindeer, and elk. In the Altai mountains the occurrence of the bison, mountain goat and sheep, red deer, bear, and leopard is attested.

The Sartan Glacial, which included the LGM, featured only a limited development of ice-sheets which were confined to the southwestern Yamal Peninsula, and the Byrrangha Mountains in the Taymyr peninsula (Velichko et al. 1998). Limited-scale mountain glaciers have been identified in the Altai. In the Trans-Baikal mountains, the local glaciers advanced by 3-4 km along river valleys. Pollen data show a uniform spread of the tundra and cool steppe and the absence of a continuous forests, with local refugia of broadleaf forests in the South Siberian mountains (Derevyanko et al. 1993).

Frenzel et al. (1992) reconstruct a considerable thermal depression, with February temperature by about 12 ° C, August temperature, 6° C lower than at present, and the annual precipitation between 50 and 250 mm below the present values. Quantitative reconstructions of LGM climate for the southern part of western Siberia and northern Mongolia (Tarasov et al. 1999) show winters to be by 7-15 ° C and summers, by 1-7° C colder than today, with the precipitation basically similar to present-day values.

Human Settlement

The character and the very existence of the Upper Palaeolithic in Siberia remains a debated issue. Grigor'ev (1977) totally denies the existence of the UP in Siberia, referring to this entire period as 'Post-Mousterian'. This view has been contested by Okladnikov (1981), who argued that 'the phase of transition from the Middle to Upper Palaeolithic' in Southern Siberia had taken a specific form, marked by the dominance of the Levallois technique combined with pebble cores, as well as discoid and pyramidal nuclei. The subsequent period saw the evolution of the Levallois technology into the 'Gobi' one typified by wedge-shaped cores. Okladnikov's views were further developed by Derevyanko et al. (2000), who based on the records of the Kara-Bom cave site in the Altai Mountains, have identified a 'transitional phase' which origins were sought in the local Mousterian and which features the Levallois technology combined with the technique of 'parallel reduction' of uni- and bipolar cores aimed at the removal of 'elongated blanks'.

1. The Early Stage

A reliable series of radiocarbon dates indicates a group of early sites in the Altai Mountains (Figure 2). This group includes several cave sites: Kara-Bom, Okladnikov, Strashnaya, Denisova, Kara-Tenesh, Anui 2, and an open-air site of Ust-Karakol (Derevyanko & Markin 1998). Radiocarbon dates, both conventional and AMS, show the age between ca 40 and 30 ka reaching 42 (Kara-Tenesh) and 44 ka (Kara-Bom). The sites vary in the thickness of archaeological deposits presuming the variable duration, seasonality, and intensity of their habitation. In most cases, the sites were stratified and included the levels attributed to the Achealean, Mousterian, UP, and later periods. The sequence of the site of Kara-Bom (Derevyanko et al. 2000), includes two Mousterian and six levels considered as UP, the upper Mousterian and lower UP levels yielding statistically indistinguishable dates (>44 ka and 43200 ± 1500 respectively). These levels included identical animal remains and the

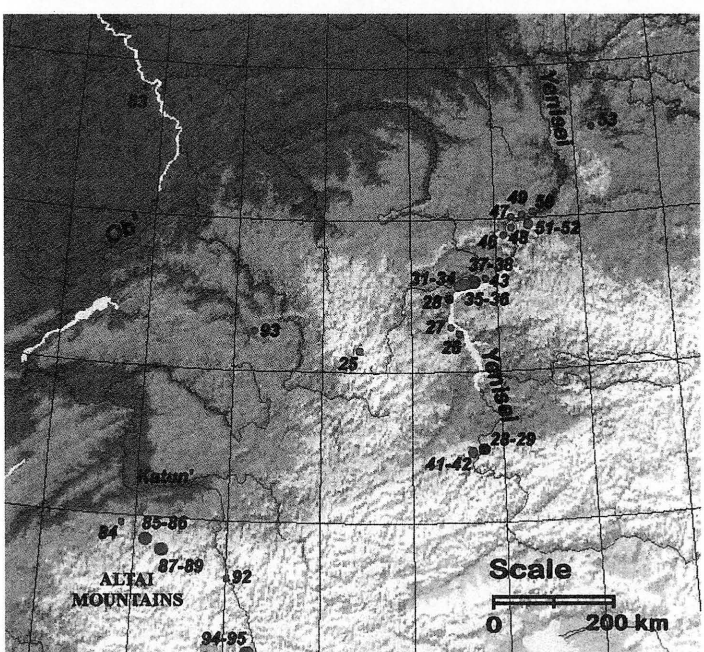

Figure 2. Radiocarbon-dated sites. Southern-Central Siberia. The Altai Mountains and Yenisei.

pollen indicative of a steppe with rare occurrences of broadleaf trees. Both the Mousterian and early UP levels include the same categories of artefacts: the Levallois-Mousterian, notched-denticulate, and Upper Palaeolithic. The main distinction consists in an increased rate of 'elongated blades' observable in the early Upper Palaeolithic level. Derevyanko et al. (2000: 47) note that the common elements in these two levels outweigh their distinctions. The Okladnikov Cave yielded human remains: five teeth and three postcranial skeletal fragments. Alexeev (1998) has concluded that all fragments except one tooth bear no deviations from the morphology of modern humans. Only one molar found in the third level shows an 'archaic trait'. The animal remains combine the extinct species (woolly rhinoceros) with presently existing animals adapted to forest bioms (brown bear, wolf, bear), and the steppe (wild horse, kulan wild ass, and gazelle).

AMS dates in the order of 33-39 ka have been obtained for the sites in Baikal area of Southern Siberia (Figure 3): Makarovo 4 in the upper stretches of the River Lena, and Varvarina Gora on the Bryanka River in Buryatia. Goebel and Aksenov (1995) stress 'technological and typological similarities' of the former site, which included a strong blade element, with 'the basal upper Palaeolthic component at Kara-Bom'. The animal remains consisted of woolly rhinoceros, (in both cases), red deer, roe deer (Makarovo 4), Mongolian gazelle, and argali sheep (Varvarina Gora).

Conventional radiocarbon dates have been reported for the sites in the Yenisei Valley:

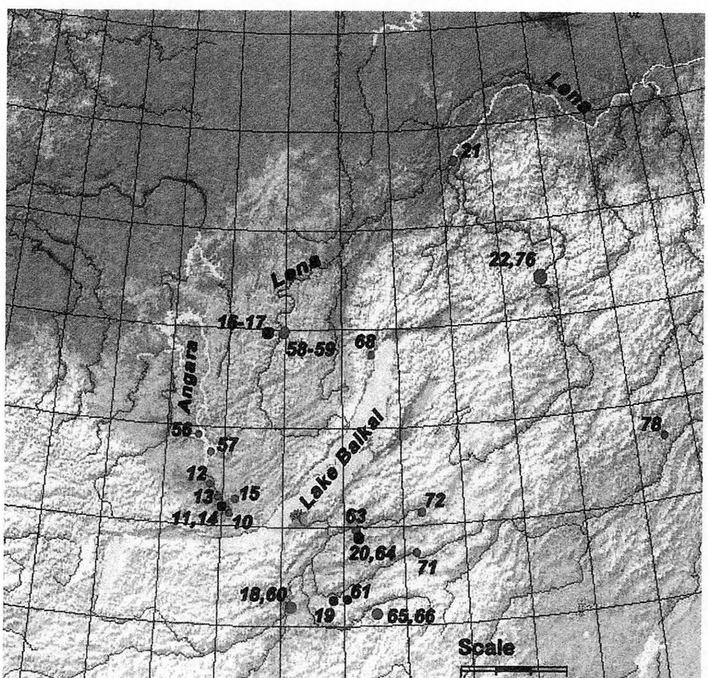

Figure 3. Radiocarbon-dated sites. Southern-Central Siberia. The Angara and Baikal Areas.

Kamennyi Log (31.8 ka), and Kurtak (33.7 ka), and the upper Angara catchment: Druzhiniha (43.5 ka) and Ust-Kova (34.3 and 28.0 ka). The conventional date of 29 ka has been achieved for the lower level of Military Hospital site in the city of Irkutsk, near the sources of the Angara River. In the Trans-Baikal area the date of 26.9 has been obtained for the sites of Tobalga on the Khilka River and Arta-2 (37.3 ka) on the river of the same name.

2. The Middle Stage

The sites with the radiocarbon dates in the range of 25-17 ka. have been identified on the terraces of the Yenisei River: Kurtak 3 (24.1 ka), Novos'olovo (21 ka) and Tarachikha (19.8 ka). In the latter case, the inventory included prismatic cores and secondary retouched tools made on blade blanks, combined with leaf-shaped points and pebble tools. The animal remains consisted of the mammoth, woolly rhinoceros, wild horse, reindeer, bison, and wild goat. To this stage also belongs the site of Ui 2 (22.8 ka), found on the terrace in the southern, mountainous stretch of the Yenisei River.

A large concentration of sites, viewed as seasonal camps, occurred on the terraces in the valleys of the Angara and its tributaries. This cluster included the 'classical' UP sites of Siberia: Mal'ta (20.7 ka) and Buret' (21.1 ka), as well as such sites as Masterov Kluch (24.3 ka), Igutinskiy Log (23.5 ka), Alexeevka (22.4 ka), Shishkino (21.9 ka). The Kurla 3 on the northwestern shore of the Lake of Baikal belongs to the same stage (24.0 ka).

3. The Later Stage

To this stage belong the sites showing the radiocarbon age in the range of 17-11 ka. The frequencies of these sites are the highest for the whole period under consideration (Figure 4). This stage includes several open-air sites located on the lower terraces within the Minusinsk depression in the middle stretches of the Yenisei River, forming the Kokorevo (19.9-12.6 ka) and Afontova Gora groups (14.5-11.9 ka). The industry of the latter group was based predominantly of the flake blanks with the high proportion of wedge-shaped cores and the common occurrence of end-scrapers. At several sites choppers and

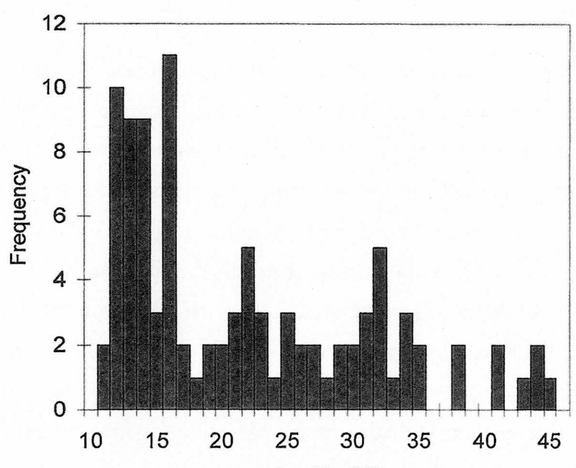

Figure 4. Frequencies of radiocarbon-dated sites. Southern-Central Siberia.

wedges were noted. Five fragments of human bones have been found in the deposits of Afontova Gora 2 site. The industry of the Kokorevo group was manufactured predominantly on the blade blanks and included numerous secondary retouched tools. Fragmented human remains, including a frontal bone, a radius, a humerus, and child's teeth, all unquestionably modern humans, were found at Afontova Gora 2 site. Animal remains consisted of the wild horse, aurochs, red deer, wild goat, and arctic fox. The group of Golubaya sites (13.0 ka) located on the right tributary of the Yenisei is distinctive by the higher rate of retouched blades and microblades.

A cluster of stratified sites at Maina allegedly resulting from seasonal habitations has been found on the terraces of the Yenisei and its tributary, the Maina, in the northern foothills of the Sayan Mountains. Stylistically related to the Afontovo group, these sites were radiocarbon dated: Maina - 15.2 and 12.1 ka; Ui 2: 11.9 ka. The animal remains included the bison, kulan, red deer, and Siberian goat. Pollen indicates fluctuations in the vegetation ranging from the cold steppe with rare birch and pine forests to mixed forests and an open steppe (Vasil'ev 1983). Further to the east, the radiocarbon measurement of 12.0 ka has been obtained for the site of Strizhevaya Gora on the River Kan.

This stage includes a group of sites in the Trans-Baikal region of Southern Siberia, which inventories contain the microblade component combined with wedge-shaped cores. A series of AMS dates with the mean value of 17.4 has been obtained for the site of Studenoe-2 on the the Chikoi River (Goebel et al. 2000). Other sites in that area with the similar component revealed a younger age: Menza-2 on the same river: 16.9-14.8 ka, and Sokhatino 3, on the river Ingoda near the town of Chita :15.8 ka.

North-East Siberia and Russian Far East

Environments

Only limited-scale montane-valley glaciers occurred in the mountain ranges of north- eastern Siberia and the Russian Far East even during the coldest stages of the Last Ice Age. A particular type of 'yedoma' relief developed in the permafrost-affected lowlands which consitsted of small hills, steep-sloped plateaus, and narrow meadowy depressions.

According to the recent estimates by Anderson and Lozhkin (2001), the climate of North-East Siberia during the Karginian Interval was either similar or slightly colder than now, with considerable areas taken up Larix forests. Pollen and plant macrofossil records of the Faddeyevskiy Island, the New Siberian Archipelago in the Arctic Ocean (Andreev et al., in press) suggest the summer temperature to be by at least by 2° C warmer than today, with the steppe- and tundra-type vegetation on the exposed Arctic shelf between 43 and 25 ka. The biomass of the local landscapes was sufficiently high to support large populations of herbivores. Accumulations of the bones of mammoth, reindeer, and wild horse were radiocarbon-dated between 36.7 and 12.5 ka.

During the Sartan Glacial one notes a rapid reduction of forests, with the 'tundra-steppe' becoming the dominant vegetation. The biomass remained sufficiently high to sustain numerous herds of diverse herbivores.

Based on pollen records, Velichko et al. (1997) argue that the present-day northern tundra became established in the lowlands already at 15-14 ka, interrupted only by the limited spread of forest-tundra in the Alleröd (c. 11 ka). On the other hand, the pollen records for archaeological deposits of the Dyuktai Cave on the Aldan River in Yakutia show a series of vegetation changes, from sparse coniferous forests to the tundra (Mochanov & Savvinova 1980).

In the Maritime Region (Primorskiy Kray) of the Russian Far East, considerable areas were taken up by rarefied birch-larch and spruce-birch-larch forests, with the forest-tundra and mountain tundra on higher levels. Korotkii (1996), assessing his own pollen records, suggests that the interval between 20 and 17 ka was very dry and cold. At 18 ka the winter temperature was by 15° C, the summer temperature - 10° C, and the annual precipitation - 400 mm lower than today. The same writer argues that the climate in that area remained significantly colder than today until the beginning of the Holocene, with precipitation slightly rising above the present values at about 12 ka (Korotkii 1996).

During the Karginian Interglacial (50-22 ka) the sea-level was at least 40 m lower than now (Pavlidis et al. 1997). The maximum drop in the sea-level, by 130 m, occurred at the LGM, and this led to the displacement of the shoreline 400-700 km off its present position and the exposure of considerable areas of the shelf. This resulted in the emergence of the Beringia land-mass linking the Siberian mainland with Alaska. During that period the Asian continent became connected both with the Sakhalin Island and the Japanese Archipelago. This land bridge remained in place until 10 ka, when the level of the Japan Sea was 50 m below its present position. (Korotkii 1997).

Human Settlement

1. The Early Stage

Radiocarbon dates indicative of human settlement in that vast area at this stage have been obtained for two sites on the lower and middle stretches of the Aldan River in Yakutia: Ihnie 2 (31.2 ka) and Ust-Mil' 2 (33 ka) (Figure 5). According to Mochanov (1977, 1984) these sites correspond to the 'Proto-Dyuktai', the cultural tradition, essentially different from those known in southern-central Siberia.

In the Russian Far East a date of 32.5 ka has been reported for the Geographical Society Cave, in the mountain range north of the town of Nakhodka. Stratigraphy of the cave suggests repeated seasonal occupations. The animal remains included the mammoth, woolly rhinoceros, wild horse, roe, and red deer.

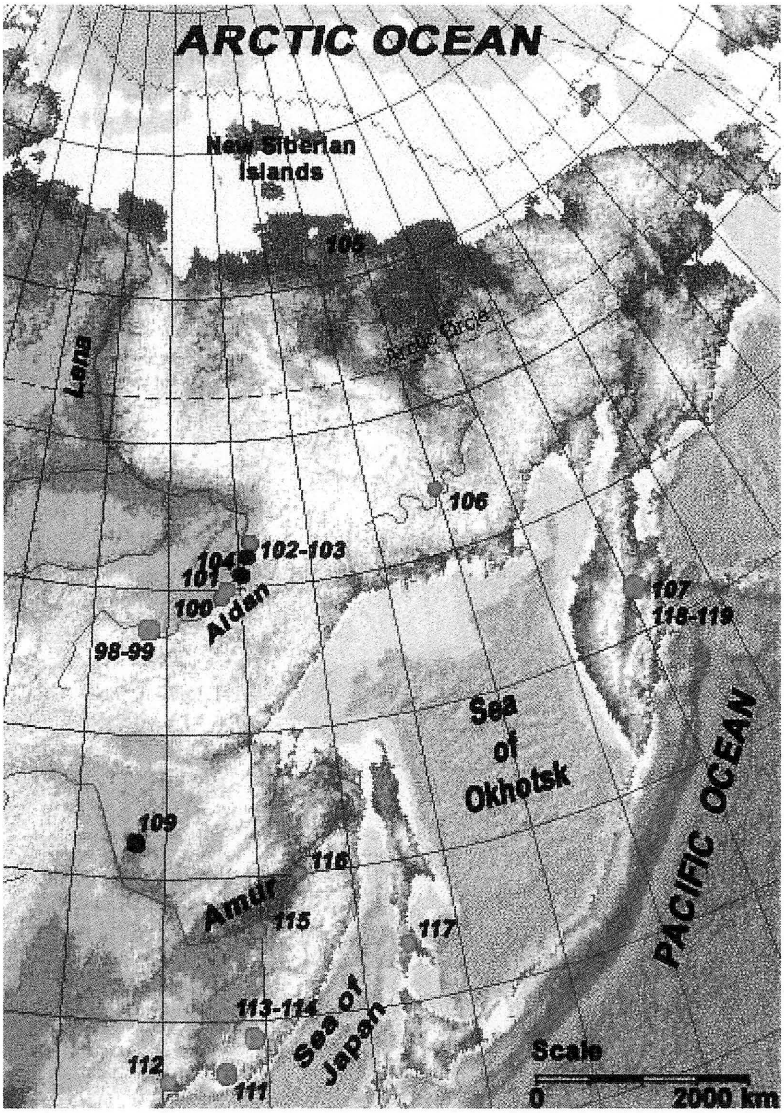

Figure 5. Radiocarbon-dated sites. North-Eastern Siberia and Russian Far East.

2. The Middle Stage

The sites radiocarbon-dated to this stage have been found on the Aldan River: Ihine (20.0 ka) and Verhne-Troitskoe (17.6 ka). The date of 20.3 has been obtained in an unclear archaeological context for the site of Filimoshki on the River Zeya. The site of Ogonki 5 on the Sakhalin Island (19.0 ka) falls into the same time-span (Figure 4).

3. The Later Stage

Likewise, in the southern-central part of Siberia, the radiocarbon-dated sites of this stage show the highest frequencies. (Figure 4) This stage comprises the greater part of the sites found in the alluvial deposits of the Aldan River and attributed by Mochanov (1986) to the Dyuktai Culture. The dated sites include the Dyuktai Cave (14.0 ka) and Ust'-Timpton (10.5, 10.3 ka). Culturally related sites were found near the Arctic coast (Berelyoh: 11.8 ka) and in the Kolyma River basin (Siberdik: 13.2 ka). The stone inventory of these sites included the disc-shaped cores, flaked bifaces, a variety of tools produced on flake blanks, wedge and prismatic microcores and microblades. The lack of archaic pebble tools in the inventories of sites that area, likewise the Trans-Baikal, the Amur basin and the Maritime Region, is considered by Mochanov as culturally significant.

Still further to the east, a series of radiocarbon dates became available for the stratified site of Ushki 1 on the Kamchatka Peninsula (Dikov 1977). The dates of 13.6, 11.1, and 10.3 are considered as the most reliable.

Another cluster of sites was located in the Maritime Region of the Russian Far East. The dated sites include Suvorovo 4 (15.5 ka) and Ustinovka 3 (11.5 ka). These sites feature the wedge- and boat-shaped cores, leaf-shaped bifaces, and the microblade tradition typical of Eastern Asia (Kononenko & Cassidy 1999).

Several sites located on the lower stretches of the Amur River include the fragments of organic-tampered ceramic wares found in the context of the microblade lithic technology. The subsistence of these sites was solidly based on hunting-gathering, and intensive procurement of riverine/maritime resources. The dates for early pottery sites-bearing sites in the Russian Far East are: Hummi: 13.2 and Gasya: 12.9 ka (Derevyanko & Medvedev 1997; Kuzmin & Orlova 1999).

Discussion

1. Dispersal

Basing on radiometric and genetic molecular evidence, one may visualize that the spread of early modern humans into Eurasia proceeded from a large area encompassing India, Caucasus, and the Levant, where they became established 100-70 ka. From that area migrations proceeded in the northern and western directions, reaching the confines of Europe 50-40 ka.

The distribution of radiocarbon dates for Palaeolithic sites in Northern Eurasia shows at least three peaks which may be viewed as reflecting three separate waves in the colonization of that area by human groups moving from European area in the eastern direction. The early peak has a radiocarbon age of 40-30 ka, Isotope Stage 3, the 'Interpleniglacial' of the

Last Ice Age. The sites of that age are acknowledgeable across the East European Plain, including the Pechora River north of the Polar Circle. Further east, a concentration of sites of that age is identifiable in the Altai Mountains with several sites in the Baikal Lake area of Southern Siberia. The sites are known also in Yakutia and the Maritime Region (Figure 6).

As had been mentioned, an influential school of thought ascribes the authorship of 'archaic' UP industries (the Chatelperronian, Uluzzian, and others) to surviving groups of Neandertals. Archaic UP indstries are also known on the East European Plain (e.g. the Streletsian). Nearly all Palaeolithic sites in the Altai Mountains in Southern Siberia radiocarbon dated to 30 ka and older are considered as Mousterian, due to the strong presence of the Levallois technology. If one looks further east, archaic elements are abundant in the sites of similar age in China and Mongolia. The inventory of the Salawusu site on the Ordos Plateau in Inner Mongolia, dated to 50-37 ka, contains pebble cores reduced by a 'direct percussion' as well as flake tools (Jia Lanpo & Huang Weiwen 1985). The same level reportedly yielded the remains of *homo sapiens* (Wu Xinzhi & Wang Linghong 1985). The femur and tibia of a child at the site of Yamashita-cho on Okinawa, with the radiometric age of >32 ka, are considered as belonging to AMH (Trinkaus & Ruff 1996). Since never, either on the East European Plain, or in Siberia, or China, have archaic-looking industries been found in a clear association with the remains of Neandertals or other pre-sapiens humans, one may reasonably suggest that all these industries were manufactured by the groups of AMH. Their advancement proceeded from the west to the east, covering the entire East European Plain and further

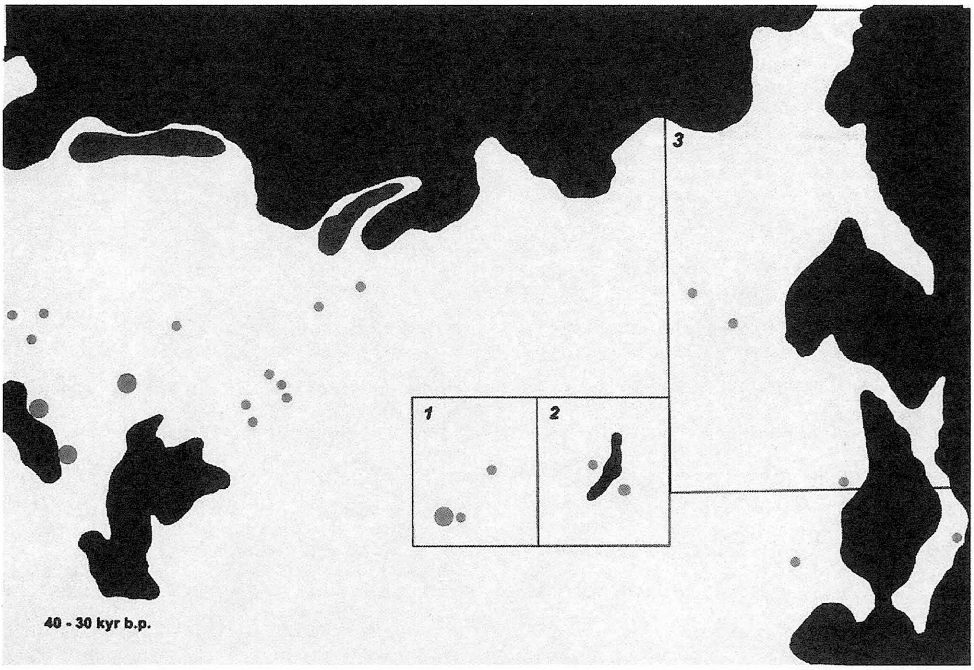

Figure 6. Northern Eurasia. 40-30 ka BP.

leading into Southern Siberia, Mongolia, Northern and Central China, and the Russian Far East. As land bridges linked the Siberian mainland with Sakhalin Island and Hokkaido, one may imply an occasional penetration of early AMH to the Japanese Archipelago at that stage.

The next stage in the settlement of Northern Eurasia by early modern humans occurred during the time-span of 32-18 ka. This was the coldest period of the Last Ice Age that included the Last Glacial Maximum (LGM). Remarkably, this episode coincided with the quasi-total depopulation of Western-Central Europe, with all Palaeolithic sites virtually disappearing in that area (Housley et al. 1997). Significantly, during the same period the AMH population rose in the East European Plain, the frequency of Palaeolithic sites markedly increasing at 29-26 and forming a clear maximum at 24-18 ka. One notes a significant increase in frequencies of sites in southern-central Siberia forming two maxima, at 32 and 22 ka. The sites of that age also appeared in Yakutia and Russian Far East (Figure 7).

With the fall in the sea-level by at least 130 m, the Japanese Archipelago became available via land bridges both in the north (Hokkaido-Sakhalin) and in the south (Kyushu-Tsushima-Korea). This may account for the proliferation in Japan of sites with the component of blade technique (Oda & Keally 1979).

The final stage in the colonization of northern Eurasia by modern humans falls to the time-span of 17-10 ka (Figure 8). At that time, one remarks a strong growth in the frequencies of Palaeolithic sites in European Russia, which by their topography and cultural characteristics were distinct from the previous ones. At that stage the frequencies of sites in Siberia formed an all-time maximum. Networks of Palaeolithic sites arose in the river system of the extreme northeast including Yakutia and Kamchatka, and also in the Lower Amur and Maritime Province in the Far East.

In the latter area and, particularly, the lower Amur catchment, starting with 13-11 ka, one notes the development of a network of sedentary or seasonal settlements with the evidence of pottery-making. The subsistence of these sites was solidly based on the exploitation of riverine and estuarine resources with the emphasis on the procurement of spawning salmon (Kononenko 1998). By their stylistic and technological characteristics, the ceramic ware of the Lower Amur sites finds analogies in certain varieties of early Jomon pottery in Japan (Kajiwara 1998). Hence one may suggest the occurrence of a social network based on the riverine-maritime adaptation which encompassed the entire circum-Japanese (and, possibly, Okhotsk) Sea area. With the gradual rise of the sea-level, the 'northern route' became the only viable way by which Japan remained connected to the Asian landmass. A marked increase in the frequencies of sites belonging to 'Micro-Blade' and 'Incipient Jomon' traditions may have been largely due to the population influx from the continent.

During the same period, human groups stemming from North-East Siberia spread to America. Existing evidence suggests that this was a predominantly coastal migration: along the southern margin of the Bering Land Bridge and further south along the Pacific Coast of the Americas (Dixon 2001).

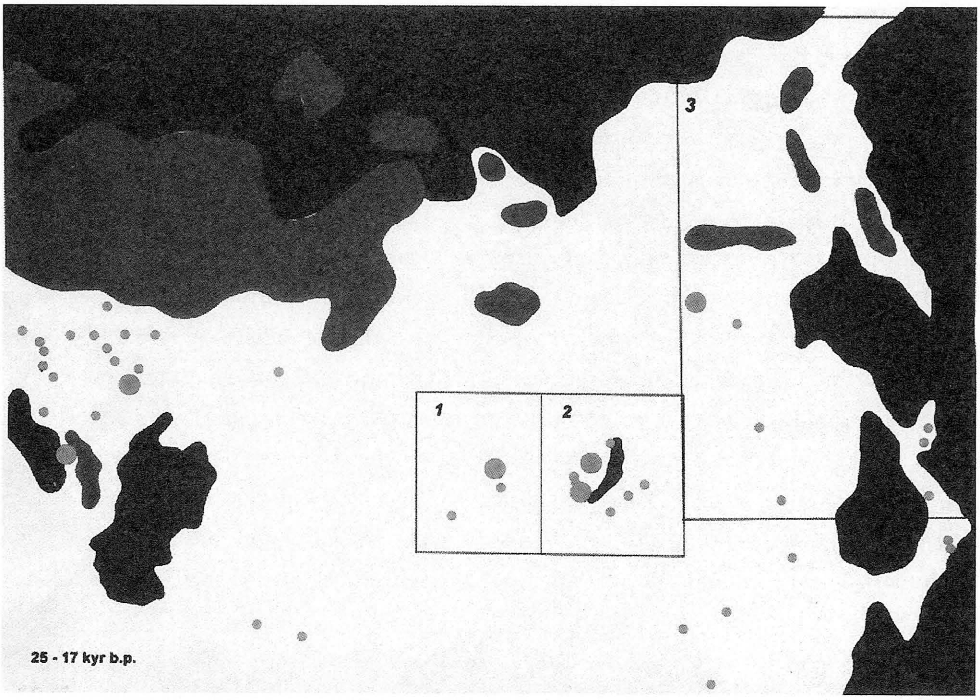

Figure 7. Northern Eurasia. 25-17 ka BP.

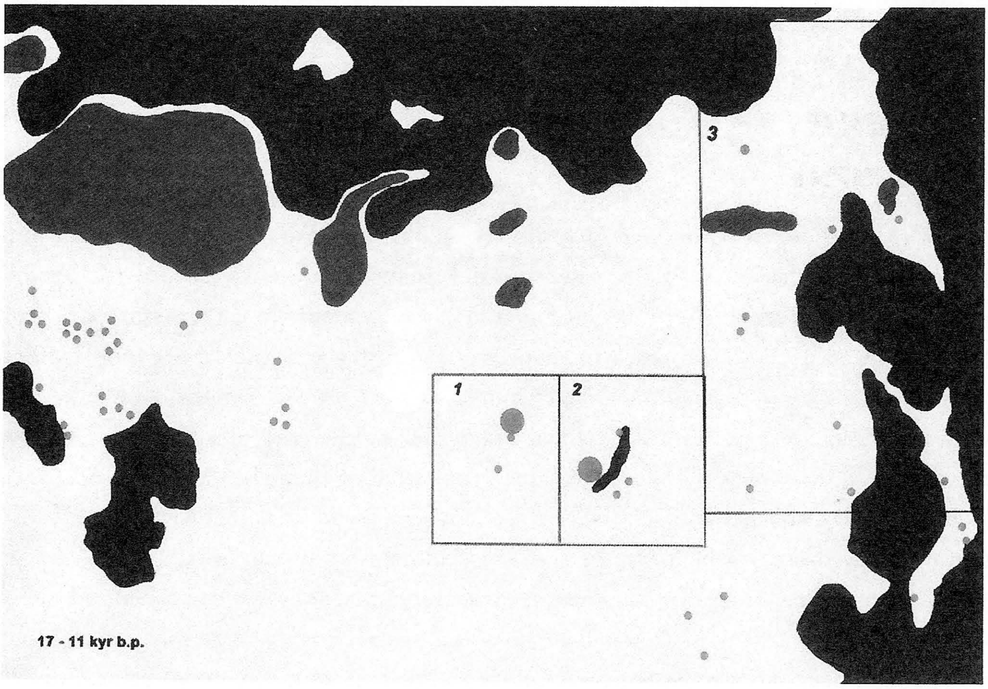

Figure 8. Northern Eurasia. 17-11 ka BP.

2. Causal Mechanisms

Discussing the causal mechanism of large-scale human displacements, two related factors are identified as prime movers: environmental stress and inbreeding avoidance. Observations of baboons in their natural habitats (Lee 1983) show that the individual distances and the group dispersal became considerably extended in the periods of low availability of food. This may be further substantiated by ethnographical evidence. Shternberg (1933), based on his field observations of the Nivkh (Gilyak) hunter-gatherers in the late nineteenth century, reported numerous occasions when, in the conditions of an environmental or social stress, certain individuals, families, and even clans changed their usual habitats. He has quoted the case of the 'Nila-wo' clan, which moved from South Sakhalin Island, first to the northwestern coast, then having crossed the Tatar Strait, settled on the Middle Amur, eventually losing their language and identity.

Recently available evidence may shed new light on palaeoenvironmental factors accountable for east-bound migrations of early humans during the Last Ice Age. According to reliable reconstructions (Frenzel et al. 1992; Tarasov et al. 1999), the landscape of the entire northern Eurasia at that time was dominated by the tundra and 'cool' steppe, the climate being generally colder and drier than now. Yet the negative anomalies of both winter and summer temperatures were higher in the west than in the east. Despite a decrease by about 200 mm (Tarasov et al. 1999), the annual precipitation in European Russia remained sufficiently high (ca 400-500 mm/yr) to produce a thick snow cover. A similar decrease of precipitation in Siberia would have caused only a thin snow cover and the setting similar to one that now occurs in Central Mongolia (where the winter precipitation is between 5 and 30 mm). Hence, the conditions for winter pastures in the east were more favorable: large herds of herbivores were well provided with the fodder easily available beneath the thin snow cover.

Regarding the second major factor, it has been observed (Cheney 1983) that among Old World monkeys, males tend to migrate to neighboring groups, while females prefer to remain in their native units throughout their lives. Population geneticists (Cavalli-Sforza & Bodmar 1971) note that in this case, the inbreeding depression is significantly reduced. Exogamy is usually viewed as the most viable mechanism of inbreeding avoidance in the societies of hunter-gatherers. Observations on modern hunter-gatherers show (Shternberg 1933; Godelier 1986) that both the Far Eastern Nivkh and the New Guinea Baruya were only partially exogamous, marriages with distant patrtilineal cousins being permissive in both cases. Shternberg cites numerous cases when Nivkh individuals escaping persecution and failure quit their paternal tribe and sought refuge in neighboring alien groups. They became adopted, and, having married usually a widowed woman, acquired the language and habits of the adoptive tribe. Their offspring either formed a new lineage or became incorporated into an existing one. Shternberg has noted that according to his records, the majority of the Nivkh lineages claimed their ancestors as being members of alien clans. Godelier (1986: 4) equally notes that eight out of fifteen Baruyu clans descended from the 'Menyemya refugees'.

Russian prehistorians, basing predominantly on archaeological evidence, propound that the Upper Palaeolithic population in the periglacial Eastern Europe consisted of loose social units which included several 'blood-related' paired families, their numbers seasonally fluctuating between 5-10 and 15-20 (Grigor'ev 1968). In several cases one notes the establishment of 'co-residential groups', which included several distinct social units with semi-permanent dwellings, the Kostenki sites on the River Don forming the most spectacular example.

The stability of large social groups was never absolute; their lifestyle included considerable seasonal displacements within an 'exploitation area'. This implied institutionalized encounters with other groups resulted in the establishment of 'negotiated alliances' and mating networks. They included diverse social relationships with a regular circulation of persons and goods, the ties being of variable intensity and duration. There are material indications for the occurrence of a complex exchange network in the Upper Palaeolithic East European Plain linearly directed along major river systems (Soffer 1985). This implied the emergence of smaller social entities with the group identity signalled in stylistic and ritual behavior. Regularly occurring contacts between these groups resulted in the formation of 'alliance networks'. Notwithstanding their local distinctions, these higher rank entities featured certain fundamental similarities acknowledgeable in the mode of life and symbolism (Grigor'ev 1993).

An active interaction is distinctly signalled among Late Glacial groups in the North-European Plain, particularly conspicuous in the exchange of lithic raw material. During the period of Younger Dryas (11-10 ka), the so-called 'chocolate flint' from the mines in Central Poland was predominantly in use in the Vistula Valley within 200 km from the source, isolated finds of this flint being found at the distance of 500 and even 750 km. This area of active interaction is viewed by Schild (1996) as corresponding to the groups' 'seasonal migrations' and/or 'intermarriages'.

3. Racial Affiliation

Russian physical anthropologists (Debetz 1936; Alexeev & Gokhman 1984) have identified among the Bronze and Iron Age skeletal materials of European Russia and southern Siberia a so-called Cro-Magnon variety that combined the cranial robustness with a broad face, and which origins were sought in the Upper Palaeolithic. V.P. Alexeev (1974: 140), discussing the origin of the Mongoloid race, has argued that its sources lie in the early Upper Palaeolithic, stressing that originally the Mongoloid features were much less pronounced, being similar to those of present-day Amerinds.

Human remains found at the site of Afontova Gora 2, which included a fragment of the frontal bone, have been identified by Debetz (1946) as northern Asian Mongoloids. Mongoloid features have been originally acknowledged in the skeletal remains of a child found at the site of Malta, yet Alexeev (1998: 323) in his later publication expressed a cautious view saying that this area was inhabited by a 'population of Mongoloid appearance.' Discussing the skeletal remains from the Zhoukoudian Upper Cave (the 'Old Man'), Kamminga (1992) argues that this specimen, being distinct from the 'modern Mongoloid morphology', lies relatively close to that of the Ainu.

This view has recently found support in molecular genetic evidence. Based on the analysis of HLA genes and haplotypes, Bannai et al. (2000) argue that the Ainu-related groups formed the original population of Japan and that they had migrated from East Asia during the Upper Palaeolithic. According to their data, the Ainu were genetically closely related to both East Asian and Native American groups. Regarding the population history of the Japanese, Hanihara (2000) has advanced a 'dual structure model' which assumes that the Jomon groups were the first occupants of the Japanese archipelago. Baba (2000), using genetic criteria, argues for the 'Jomon people', who were genetically and morphologically identical to historically attested Ainu, to be genetically closer to 'North-Eastern Asians'.

4. Languages

Groups of modern humans, which formed archaeologically and genetically recognizable alliances during the Last Ice Age, were supposedly in possession of a common communication medium in the form of a mutually comprehensible language or a *lingua franca.* The present writer has made a suggestion that these communication media in the Upper Palaeolithic periglacial Europe were related to Uralic languages (Dolukhanov 1994).

This suggestion was later substantiated by several linguists (Wiik 1997; Künnap 1998) who were able to identify the Uralic substratum in the Slavic, Baltic, and Germanic languages. Uralic languages, which include the Finno-Ugric and Samoyedic branches, are currently spoken by more than 21 million people in Central, North-eastern Europe and North-western Asia.

Significant similarities between the Uralic (particularly Samoyed) and several Palaeosiberian languages (including the Eskimo and Chukotkan) have been attested by several scholars (Pusztay 1995; Künnap 1997). Currently Forescue (1998) has suggested that Uralic languages were related to the languages located further east, in Siberia and across the Bering Strait. Present-day descendants of this 'Uralic-Siberian' proto-language form four language families: the Uralic, Yukagir, Eskimo-Aleut, and Chukotkan-Kamchatkan.

Relationships of the Uralic languages to the Altaic family form yet another debated issue. The latter family includes the Turkic, Mongolian, and Manchu-Tungus branches with more than 50 languages and the total of 135 million speakers. These languages show strong similarities in the morphology, syntax, vocabulary, and particularly the phonological correspondences, which enable scholars to reconstruct a hypothetical Altaic proto-language (Poppe 1965). Certain typological similarities are acknowledged between the Uralic and Altaic families; Fortescue (1998, 52) writes about the Ural-Siberian being 'remotely related' to the Altaic family, the affinities being acknowledged in several elements of Proto-Mongolian language.

Relations of the Japanese and Korean languages to the Altaic family is yet another matter for debate. According to Miller's (1971) scheme, the Proto-Altaic initially split up into the Proto-Western and Proto-Eastern branches; the former developing into the Old Turkish, the Proto-Bulgarian, and other languages, and the latter further branching into the Proto-Mongol and the Proto Northern/Peninsular Altaic. At a later stage, that gave rise to the Proto-Peninsular and Pelagic unities, which subsequently developed into the Korean, Japanese, and Ryukyu.

The present writer holds the view that attempts to directly identify currently existing languages with archaeological and/or anthropological entities are largely futile. Language is a system of communication; the evolution of language was controlled by the interaction and/or isolation of human groups and their internal structure. It is very likely that the observable language affinities are the reflection of the processes that occurred at a comparatively recent stage, a long time after the first groups of modern humans had became established in that area. Yet it is also probable that these affinities are the evidence of a much older substratum, a *lingua franca*, that served as a communication medium for loose groups of hunter-gatherers who colonized Northern Eurasia during the course of the Ice Age.

Conclusions

1. The colonization of Northern Eurasia by modern humans took the form of three consecutive waves, spreading from the west towards the east in the time-span between ca 40 and 10 ka.
2. All three waves consisted entirely of Homo sapiens.
3. The advancing groups included softened Mongoloid elements.
4. They spoke languages related to the present-day Uralic-Siberian and Altaic families.

References

Alekseev, V.P.

1998. The physical specificity of Palaeolithic Hominids in Siberia. In A.P. Derevyanko (ed.). *The Palaeolithic in Siberia*, 329-331. Urbana, IL: University of Illinois Press.

Alexeev, V.P.

1974. *Geografiya chelovechskih ras.* Moscow: Nauka.

Alexeev, V.P. & Gokhman, I.I.

1987. *Antroplogiya aziatskoi chasti SSSR.* Moscow: Nauka.

Anderson, P.M. & Lozhkin, A.V.

2001. The Stage 3 interstadial (Karginskii/middle Wisconsinian) of Beringia: Variations in paleoenvironments and implications for palaeoclimatic interpretations. *Quaternary Science Reviews* 20: 93-125.

Andreev, A.A., Peteet, D.M., Tarasov, P.E., Romanenko, F.A., Filimonova, L.V., & Sulerzhitsky, L.D.

2001. Late Pleistocene interstadial environment on Faddeyevskiy Island, East-Siberian Sea, Russia. *Arctic, Antarctic, and Alpine Research* 33(1): 28-35.

Arslanov, H.A.

1992. Geohronolgochskaya shkala pozdnego pleistocena Russkoi ravniny. In V. Murzaeva, J.-M. Punning & O. Chichagova (eds.). *Geohronologiya chetvertichnogo perioda,* 16-22. Moscow: Nauka.

Baba, H.

2000. Biological Anthropology. In M. Hudson (ed.). *Interdisciplinary Study on the Origins of Japanese Peoples and Cultures,* 11. Kyoto: International Research Center for Japanese Studies.

Bannai, M., Ohashi, J., Tarihara, S., Takahashi, S., Juju, T., Omoto, K., & Tokunaga, T.

2000. Analysis of HLA genes and haplotypes in Ainu (from Hokkaido, northern Japan) supports the premise that they descend from Upper Palaeolithic population of East Asia. *Tissue Antigenes* 55: 128-139.

Bradley, B., Anikovich, M., & Giria, E.

1995. Early Upper Palaeolithic in the Russian Plain: Streletskyan flaked stone artefacts and technology. *Antiquity* 69/266: 989-998.

Cann, R.L., Stoneking, M., & Wilson, A.C.

1987. Mitochondrial DNA and human evolution. *Nature* 325: 31-36.

Cavalli-Sforza, L.L. & Bodmer, W.F.

1971. *The Genetics of Human Populations.* San Francisco: W.H. Freeman.

Chebotareva, N.S. &. Makarycheva, I.A.

1982. Geohronologiya prirodnyh izmenenii lednikovoi oblasti Vostochnoi Evropy v valdaiskuyu epohu. In I.P. Gerasimov (ed.). *Paleogeografiya Evropy za poslednie sto tysyach let,* 16-27. Moscow: Nauka.

Cheney, D.L.

1983. Proximate and ultimate factors related to the distribution of male migrations. In R.A. Hinde (ed.). *Primate Social Relationships. An Integrated Approach,* 241-249. Oxford, London etc.: Blackwell Scientific Publications.

Debetz, G.F.

1936. Brunn-Predmosti, Cro-Magnon i sovremennye rasy Evropy. *Antropologicheskii Zhurnal* 3/1936: 310-322.

Debetz, G.F.

1946. Fragment lobnoi kosti chloveka iz kul'turnogo sloya stoyanki Afontova gora pod Krasnoyarskom. *Bulletin Komissii po Izucheniyu Chetvertichnogo Perioda* 8: 73-77.

Derevyanko, A.P.

1998. Palaeolithic of the Russian Far East. In A.P. Derevyanko (ed.). *The Palaeolithic of Siberia. New Discoveries and Interpretations*, 274-290. Urbana and Chicago: University of Illinois Press.

Derevyanko, A.P. & Medvedev, V.E.

1995. The Amur River basin as one of the earliest centres of ceramics in the Far East. In H. Kajiwara (ed.). *The Origin of Ceramics in East Asia and Far East*, 13-25. Sendai: Tohoku Fukushi University Press.

Derevyanko, A.P. & Markin, S.

1998. The Palaeolithic of the Altai. In A.P. Derevyanko (ed.). *The Palaeolithic of Siberia: New Discoveries and Interpretations*, 84-106. Urbana and Chicago: University of Illinois Press.

Derevyanko, A.P. & Markin, S.

1998. Palaeolithic sites along the Yenisei. In A.P. Derevyanko (ed.). *The Palaeolithic of Siberia. New Discoveries and Interpretations,* 116-118. Urbana and Chicago: University of Illinois Press.

Derevyanko, A.P., Petrin, V.T., & Rybin E.P.

2000. Harakter perehoda ot must'e k verhnemu paleolitu na Altae (po materialam stoyanki Kara-Bom). *Arheologiya, etnografiya i antropologiya Evrazii*, 2/2: 33-52.

Dikov, N.N.

1977. *Arheologicheskie pamyatniki Kamchatki, Chukotki I Verhnei Kolymy*. Moscow: Nauka.

Dixon, J.E.

2001. Human colonization of the Americas: Timing, technology and process. *Quaternary Science Reviews* 20: 277-299.

Dolukhanov, P.M.

1994. *Environment and Ethnicity in the Ancient Middle East.* Avebury.

Dolukhanov, P.M., Shukurov, A.M., & Sokoloff, D.D.

2001. Improved radiocarbon chronology and the colonization of East European Plain by Modern Humans. *Journal of Archaeological Science* 28: 699-712.

Errico, F., Zilhao, J., Julien, M., Baffier, D., & Pelegrin, J.

1998. Neanderthal acculturation in Western Europe. *Current Anthropology* 39: Supplement, S1- S44.

Fortescue, M.
1998. *Language Relations across Bering Strait. Reappraising the Archaeological and Linguistic Evidence.* London and New York: Cassel.

Frenzel, B., Pecsi, M., & Velichko, A.A.
1992. *Atlas of Paleoclimates and Paleoenvironments of the Northern Hemisphere.* Stuttgart: Gustav Fischer Verlag.

Godelier, M.
1986. *The Making of Great Man. Male Dominance and Power among New Guinea Baruya.* Cambridge and Paris: Cambridge University Press - Maison des Sciences de l'Homme.

Goebel, T. & Aksenov, M.
1995. Accelerator radiocarbon dating of the initial Upper Palaeolithic in southeast Siberia. *Antiquity* 69: 349-357.

Goebel, T., Waters, M.R., Buvit, I., Konstantinov, M.V., & Konstantinov, A.V.
2000. Studenoe-2 and the origins of microblade technologies in the Transbaikal, Siberia. *Antiquity* 74: 567-575.

Gokhman, I.I.
1966. *Iskopaemye gominidy.* St. Petersburg: Memoirs of the Institute of Anthropology and Ethnology, 92.

Gribchenko, Y.N. & Kurenkova, E.I.
1997. Environment and late Palaeolithic human settlement in Eastern Europe. In J. Chapman & P. Dolukhanov (eds.). *Lanscape in Flux: Central and Eastern Europe in Antiquity*, 241-252. Oxford: Oxbow.

Grichuk, V.P.
1992. Main types of vegetation (ecosystems) during the maximum cooling of the Last Glaciation. In B. Frenzel, M. Pecsi & A.A. Velichko (eds.). *Atlas of Paleoclimates and Paleoenvironments of the Northern Hemisphere*, 123-124. Stuttgart: Gustav Fischer Verlag.

Grigor'ev, G.P.
1968. *Nachalo verhnego paleolita i proishozhdenie Homo sapiens.* Leningrad: Nauka.

Grigor'ev, G.P.
1993. The Kostenki-Avdeevo archaeological culture and the Wilendrf-Pavlov-Kostenki-Avdeevo cultural unity. In O. Soffer & N.D. Praslov (eds.). *From Kostenki to Clovis.* New York and London: Plenum Press.

Grigor'ev, G.P.
1977. K razlichiyu priznakov geneticheskogo rodstva, diffuzii i stadial'nosti (po materialam paleolita). In B.A. Rybakov (ed.). *VII mezhdunarodnyi kongress doistorikiv i protoistorikov. Doklady I Soobscheniya Arheologov SSSR*, 39-40. Moscow: Nauka.

Hanihara, K.

2000. The dual structure model: A decade since its first proposal. In M. Hudson (ed.). *Interdisciplinary Study on the Origins of Japanese Peoples and Cultures*, 4. Kyoto: International Research Center for Japanese Studies.

Housley, R.A., Gamble, C.S., Street, M., & Pettitt, P.

1997. Radiocarbon evidence for the Late Glacial human recolonisation of northern Europe. *Proceedings of the Prehistoric Society* 63: 25-54

Jia Lanpo & Huang Weiwen

1985. The Late Palaeolithic of China. In Wu Rukang & J.W. Olsen (eds.). *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, 211-234. Orlando etc: Academic Press.

Kajiwara, H.

1998. The transitional period of Pleistocene-Holocene in Siberia and the Russian Far East. In A. Ono (ed.). *Symposium on Comparative Archaeology of Pleistocene-Holocene Transition*, 23-31. Tokyo: Tokyo Metropolitan University.

Kamminga, J.

1992. New interpretation of the Upper Cave, Zhoukoudian. In T. Akazawa, K. Aoki & T. Kimura (eds.). *The Evolution and Dispersal of Modern Humans in Asia*, 379-400. Tokyo: Hokusen-sha.

Kivisild, T., Kaldma, K., Metspalu, M., Parik, J., Papiha, S., & Villems, R.

1999. The place of Indian mitochondrial DNA variants in the global network of maternal lineages and the peopling of the new world. In S. Papiha, R. Deka & R. Chakraborty (eds.). *Genomic Diversity, Applications in Human Population Genetics*, 135-152. New York etc.: Kluwer Academic/Plenum Publishers.

Kononenko, N.A.

199X. Marine resources among prehistoric cultures of the Primorye Regin of the Russian Far East. *Proceedings of the Society for California Archaeology* 11: 12-19.

Kononenko, N.A. & Cassidy, J.

1999. Cultural transformations during the Pleistocene-Holocene transition in the Russian Far East. *Proceedings of the Society for California Archaeology* 13: 202-210.

Korotkii, A.M.

1996. Klimaticheskie smeny na territorii yuga Dal'nego Vostoka v pozdnem Kainozoe. Vladivostok: Institute of Geography.

1997. Morskie terrasy i chetvertichnaya istoriya shel'fa Sakhalina. Vladivostok: Dal'nauka.

Künnap, A.

1997a. *Breakthrough in Present-Day Uralistics.* Tartu: Tartu University Press.

1977b. Über einige sich ahnelnde Uralische, Eskimoische und Tschuktische Suffixe. *Linguistica uralica* 23: 97-101.

Kuzmin, Y.V. & Orlova, L.A.
2000. The Neolithisation of Siberia and the Russian Far East: Radiocarbon evidence. *Antiquity* 74: 356-64.

Kuzmin, Y.V. & Tankersley, K.B.
1996. The colonization of Eastern Siberia: An evaluation of the Palaeolithic age radiocarbon dates. *Journal of Archaeological Science* 23: 577-585.

Lee, P.C.
1983. Ecological influences on relations and social structure. In R.A. Hinde (ed.). *Primate Social Relationships: An Integrated Approach*, 225-229 Oxford, London etc.: Blackwell Scientific Publications.

Lieberman, D. E.
1998. Neandertal and Early Modern Human mobility patterns: Comparing archaeological and anatomical evidence. In T. Akazawa, K. Aoki & O. Bar-Yosef (eds.). *Neandertals and Modern Humans in Western Asia*, 263-276. New York and London: Plenum Press.

Lisitsyn N.F. & Svezhentsev, Y.S.
1997. Radiouglerodnaja hronologiya Severnoi Azii. In A.A. Sinitsyn & N.D. Praslov (eds.). *Radiouglerodnaya hronologiya verhnego paleolita Vostochnoi Evropy i Severnoi Azii*, 67-108. St. Petersburg: IIMK.

Maloletko, A.M.
1998. The Quaternary Palaeogeography of North Asia. In A.P. Derevyanko (ed.). *The Palaeolithic of Siberia: New Discoveries and Interpretations*, 14-22. Urbana and Chicago: University of Illinois Press.

Markov, K.K., ed.
1978. *Razrez noveushih otlozhenii Altaya.* Moscow: Moscow State University Press.

Medvedev, G.I.
1998. Upper Palaeolithic sites in south-central Siberia. In A.P. Derevyanko (ed.). *The Palaeolithic of Siberia: New Discoveries and Interpretations*, 122-131. Urbana and Chicago: University of Illinois Press.

Meignen, L.
1998. Hayonim Cave: Lithic assemblages in the context of the Near East Middle Palaeolithic: A preliminary report. In T. Akazawa, K. Aoki & O. Bar-Yosef (eds.). *Neandertals and Modern Humans in Western Asia*, 165-180. New York and London: Plenum Press.

Mellars, P.
1999. The Neanderthal problem continued. *Current Anthropology* 40: 341-363.

Miller, R. A.
1971. *Japanese and the Other Altaic Languages.* Chicago and London: University of Chicago Press.

Mochanov, Y.A.

1977. *Drevneishie etapy zaseleniya chelovekom severo- vostochnoi Azii.* Novosibirsk: Nauka.

Mochanov, Y.A. & Savvinova, G.M.

1980. Prirodnaya sreda i poselenija epohi kamnya i metallov v Yakutii. In Y.A. Mochanov (ed.). *Novoe v arheologi Yakutii*, 14-27. Yakutsk: Siberian Branch of the Russian Academy of Sciences.

Morozova, T.D. & Nechaev, V.P.

1997. The Vaidai periglacial zone as an area of cryogenic soil formation. *Quaternary International* 41/42: 53-58.

Oda, S. & Keally, C.T.

1979. *Japanese Palaeolithic Cultural Chronology.* Mitaka: International Christian University Research Center.

Okladnikov, A.P.

1981. *Paleolit Central'noi Azii. Moiltyn-Am (Mongoliya).* Novosibirsk: Nauka.

Pavlidis, Y.A., Dunayev, N.N. & Shcherbaskov, F.A.

1997. The Late Pleistocene palaeogeography of Arctic Eurasian Shelves. *Quaternary International* 41/42: 3-9.

Peyron, O., Guiot, J., Cheddadi, R., Tarasov, P. E., Reille, M., Beaulieu, J.-L. de, Bottema, S., & Andrieu, V.

1998. Climatic reconstruction in Europe from pollen data, 18,000 years before present. *Quaternary Research* 49: 183-196.

Poppe, N.

1965. *Introduction to Altaic Linguistics. Ural-Altaische Bibliothek*, XIV. Wiesbaden: Otto Harrassowitz.

Pusztay, J.

1995. *Diskussionsbeitrage zur Grundsprachenforschung (Beispiel: Protouralische).* Wiesbaden: Veroffentlichungen des Societas Uralo-Altaica, 43.

Prentice, I.C., Cramer, W., Harrison, S.P., Leemans, R., Monserud, R.A., & Solomon, A.M.

1992. A global biome model based on plant physiology and dominance, soil properties and climate. *Journal of Biogeography* 19: 117-134.

Ronen, A.

1992. The emergence of blade technology, cultural affinities. In T. Akazawa, K. Aoki & T. Kimura (eds.). *The Evolution and Dispersal of Modern Humans in Asia*, 217-228. Tokyo: Hokusen-sha.

Schild, R.

1998. The North European Plain and eastern Sub-Balticum between 12,700 and 8,000 BP. In L.G. Strauss, B.V. Eriksen, J.M. Erlandson & D.R. Yesner (eds.). *Humans at the End of the Ice Age*, 129-158. New York and London: Plenum Press.

Semenenko, L.T., Aleshinskaya, Z.V., Arslanov, Kh.A., Valueva, M.N., & Krasnovskaya, F.I.
1981. Opornyi razrez verhnego pleistotsena u fabriki 'Pervoe Maya' Dmitrovskogo raiona Moskovskoi oblasti (otlozheniya drevnego Tatishchevskogo ozera). *Novye dannye po stratigrafii i paleogeografii verhnego pliocena i pleistocena Central'nykh raionov SSSR*, 121-135. Nauka: Moscow.

Shternberg, L.Ya. (Sternberg Leo)
1933. *Gilyaki, orochi, gol'dy, negidal'cy, ainy. Stat'i i materially (Gilyars, Orochs, Negidals, Ainu. Works and Materials).* Khabarovsk: Dal'giz.

Sinitsyn, A.A., Praslov, N.D., Svezhentsev, Y.S., & Sulerzhitskii, L.D.
1997. Radiouglerodnaya hronologiya verhnego paleolita Vostochnoi Evropy. In A.A. Sinitsyn & N.D. Praslov (eds.). *Radiouglerodnaya hronologiya verhnego paleolita Vostochnoi Evropy I Severnoi Azii*, 21-66. St. Petersburg: IIMK.

Smith, F.H., Trinkaus, E., Pettitt, P. B., Karavani, I., & Paunovic, M.
1999. Direct radiocarbon dates for Vindija G1 and Velika Pecina Late Pleistocene hominid remains. *Proceedings of the National Academic Society* 96: 12281-12286.

Spiridonova, E.A.
1991. *Evoluciya rastitel'nogo pokrova basseina Dona v verhnem pleistocene i golocene.* Moscow: Nauka.

Stringer, C.
1998. Chronological and biogeographic perspectives on later human evolution. In T. Akazawa, K. Aoki & O. Bar-Yosef (eds.). *Neandertals and Modern Humans in Western Asia*, 29-38. New York and London: Plenum Press.

Stringer, C., Grün, R., Schwarcz, H., & Goldberg, P.
1989. ESR dates for the hominid burial site of Es Skhul in Israel. *Nature* 338: 756-758.

Tarasov, P.E., Peyron, O., Guiot, J., Brewer, S., Volkova, V.S., & Bezusko, L.G.
1999. Last Glacial Maximum climate in the former Soviet Union and Mongolia reconstructed from pollen and plant microfossil data. *Climate Dynamics* 15: 227-240.

Tarasov, P.E., Webb III, T., Andreev, A.A., Afanas'eva, N.B., Berezina, N.A., Bezusko, L.G., Blyakharchuk, T.A., Bolikhovskaya, N.S., Cheddadi, R., Chernavskaya, M.M., Chernova, G.M., Dorofeyuk, N.I., Dirksen, V.G., Elina, G.A., Filimonova, L.V., Glebov, F.Z., Guiot, J., Gunova, V.S., Harrison, S.P., Jolly, D., Khomutova, V.I., Kvavadze, E.V., Osipova, I.M., Panova, N.K., Prentice, I.C., Saarse, L., Sevastyanov, D.V., Volkova, V.S. & Zernitskaya, V.P.
1998. Present-day and mid-Holocene biomes reconstructed from pollen and plant macrofossil data from the former Soviet Union and Mongolia. *Journal of Biogeography* 25: 1029-1054.

Trinkaus, E. & Ruff, C.B.
1996. AMH remains from eastern Asia: The Yamashita-cho I immature postcrania. *Journal of Human Evolution* 30: 299-314.

Valladas, H., Mercier, N., Joron, J.-L., & Reyss, J.-L.

1998 GIF Laboratory dated for Middle Palaeolithic Levant. In T. Akazawa, K. Aoki & O. Bar-Yosef (eds.). *Neandertals and Modern Humans in Western Asia*, 69-76. New York and London: Plenum Press.

Vasil'ev, S.A.

1983. Paleoliticheskie stoyanki v zone stroitell'stva Maininskoi GES na Enisee. In V.M. Masson (ed.). *Drevnie kul'tury Evraziiskih stepei*, 67-76. Leningrad: Nauka.

Velichko, A.A.

1973. *Prirodnyi process v pleistocene.* Moscow: Nauka.

Velichko, A.A., Andreev, A.A., & Klimanov, V.A.

1997. Climate and vegetation in the tundra and forest zone during the Late Glacial and Holocene. *Quaternary International* 41/42: 71-96.

Velichko, A.A. & Morozova, T.D.

1982. Pochvennyi pokrov mikulinskogo mezhlednikov'ya i bryanskogo inyertstadiala. In I.P. Gerasimov (ed.). *Paleogeografija Vostochnoi Evropy za poslednie sto tysyach let*, 81-91. Moskva: Nauka.

Velichko, A.A. & Nechaev, V.P.

1992. Cryogenic regions during the Last Glacial Maximum (permafrost). In B. Frenzel, M. Pecsi & A.A. Velichko (eds.). *Atlas of Paleoclimates and Paleoenvironments of the Northern Hemisphere*, 108-109. Stuttgart: Gustav Fischer Verlag.

West, F.H.

1981. *The Archaeology of Beringia.* New York: Columbia University Press.

Wiik, K.

1997. The Uralic and Finno-Ugric phonetic substratum. *Linguistica uralica* 33/4: 256-280.

Wu Xinzhi & Wang Linghong

1985. Chronology in Chinese Palaeoanthropology. In Wu Rukang & J.W. Olsen (eds.). *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, 29-51. Orlando etc.: Academic Press.