Journal of Siberian Federal University. Humanities & Social Sciences 2 (2008 1) 273-283
~ ~ ~

УДК 930.1(Т2-547)

The Initial Expansion of Anatomically Modern Humans in Northern Eurasia: New Evidence and New Hypotheses

Pavel M. Dolukhanov
Newcastle University,
United Kingdom [1]

Received 10.04.2008, received in revised form 06.05.2008, accepted 15.05.2008

The initial dispersal of anatomically modern humans (AMH) in Africa occurred during a hyperarid event of 135-75 ka. Large-scale AMH expansion in northern Eurasia occurred during the Middle Weichselian glacial maximum (60-50 ka), coeval with H6 event. This expansion which included the polar regions and southern Siberia proceeded at a remarkably rapid pace, suggesting the entire area being taken up by uniform 'periglacial' landscape, equally suitable for AMH habitation. The 'transitional' industries (combining Mousterian and Upper Palaeolithic elements) are seen archaeological signatures of early AMH expansion.

Keywords: Northern Eurasia, Anatomically Modern Humans (AMH), Palaeolithic, Heinrich events.

Introduction

In recent years new data pertinent to early manifestations of anatomically and behaviourally modern humans (AMH) became available from various parts of the former USSR. This, together with new evidence from other parts of the world that includes technologically advanced radiometric measurements, climatic modelling and molecular genetics, opens up new opportunities for the hypotheses focused on the initial modern human dispersal. The present paper aims at a critical assessment of newly available evidence and suggesting novel scenarios for early AMH expansion in Eurasia.

Environments

The initial emergence and the subsequent expansion of AMH occurred during marine isotope stages (MIS) 5 d-a (117-75 ky BP) MIS 4 (75-60 ky BP) and MIS 3 (60 – 25 ky BP). This period corresponded to the Last Ice Age, known in Europe as 'Weichselian' and as 'Zyryanka' in Siberia. Considerable climate changes are recognisable throughout this period. The Greenland ice-core project (GRIP) and Greenland Ice Sheet Project (GISP) which included drilling through the base of the Greenland Ice Sheet provided the materials for stable isotope rerecords. They acknowledged signals of 24 high-frequency temperature oscillations for the last 120 ka, which became known as Dansgaard/Oeschger (DO) 'interstadial' events. These events were generally 5-6˚ C colder than now and lasted from 500 to 2000 years, involving shifts in climate (from the warm to cold) of about 7˚ C. This time-span included several 'Heinrich events' recognised on the Atlantic Ocean bottom in the form of ice rafted debris. They were formed by icebergs drifting from the margins of the Laurentide ice lobe during the cold 'stadial' events. In calendar years these episodes are dated: H6 (60 ka); H5 (45 ka); H4 (38 ka); H3 (31 ka), H2 (21-ka) and H1 (15-14 ka) (Bond et al. 1993).

The data regarding Late Pleistocene climate fluctuations are generally in agreement with recently available evidence of the ice sheet dynamics in northern Eurasia. According to now widely accepted scheme (Svendsen et al. 2004)., this period included the Early (MIS 5d-a, 117-75 ka), Middle (MIS 4-3, 75-25 ka) and Late (MIS 2, 25-10 ka) subdivisions. During the Early Weichselian an extensive Barents-Hara Seas ice sheet was formed advancing to the Putorana Plateau in Siberia. In the west it merged with the Scandinavian ice sheet restricted to the Norwegian mainland, Finnish Lapland and northern Russian Karelia. The maximum extension of the ice sheets is estimated as c. 90 ka. During the Middle Weichselian glacial maximum (60-50 ka), the Barents Kara ice sheet readvanced onto the mainland covering the Mezen and Pechora river basins. At the same time, the lobe of the Scandinavian ice-sheet filled the entire Baltic Sea and advanced to Kola Peninsula, Finland and Denmark. This episode was largely coeval with H6 event.

As show the pollen data and the 'biomic' modelling (Huijzer & Isarin 1997, Huntley and Allen 2003), the vegetation of ice-free Eurasia during both the colder and milder episodes consisted mainly of herbaceous cold-resistant plants with a limited expansion of forests restricted to the Europe's north-east. On the East European Plain the colder episodes correspond to the establishment of 'cryo-xerotic' conditions, alternating with an intensive soil building during the milder episodes (Гричук 2002).

As show the multidisciplinary investigations in the North-Minusinsk Depression, the Kurtak palaeosoil complex was formed in that area during the course of MIS3. According to the pollen evidence during the period of higher temperature and precipitation (40-32 ky BP), coniferous forests spread along the valleys of the Yenisei and its tributaries (Дроздов и др. 2007).

East European Plain

During the course of MIS 5d-a, the southern part of the East European Plain and its mountainous fringes, notably the Crimea and the Caucasus, sustained considerable populations of Neanderthal humans. These are witnessed by the sites with Mousterian-type inventories in some cases (as in the Crimea and the Caucasus) associated with Neanderthals skeletal remains. Chabai (2007) distinguishes three main periods of Mousterian occupations in the Crimean mountains: c. 125-60, 60 – 38 and 38-<28-27 kyr BP.

The early manifestations of AMH in Europe are acknowledged by the appearance of sites with upper Palaeolithic (UP) technologies. The fully developed UP are attested at 30-28 ka BP in the Crimea (Chabai 2007) and northern Caucasus (Голованова и др. 1998; Golovanova et al. 1999).

An even earlier Upper Palaeolithic occupation is signalled for the central areas of East European Plain as exemplified by Kostenki sites on the River Don**.** The earliest UP layers have been reached in the lowermost strata of Kostenki 12 site, radiocarbon dated to 40 – 42 and with OSL dates between 52 and 45 ka. Still more important evidence comes from the Kostenki 14 site, which level IVa produced a consistent series of radiocarbon measurements ranging from 36.5 to 32.6 ka BP (Anikovich et al. 2007) (Fig. 1). This level yielded a rich industry which includes a typical UP tool-kit combined with archaic bifacial, mainly oval convex-flat implements. The level includes symbolic manifestations, a head of a female figurine made of mammoth tusk, a perforated pendant made of a Mediterranean

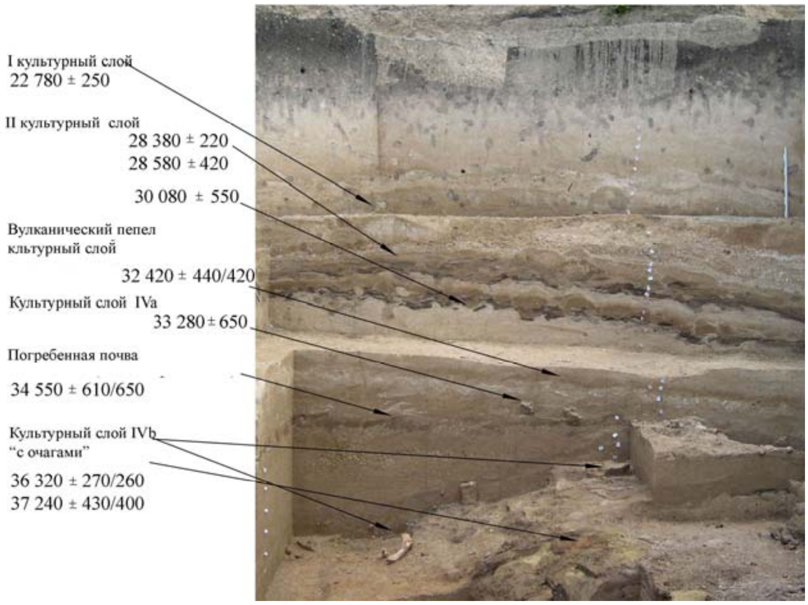

Fig. 1. The sequence of Kostenki 14 site. Arrows shows the location of samples for radiocarbon dating

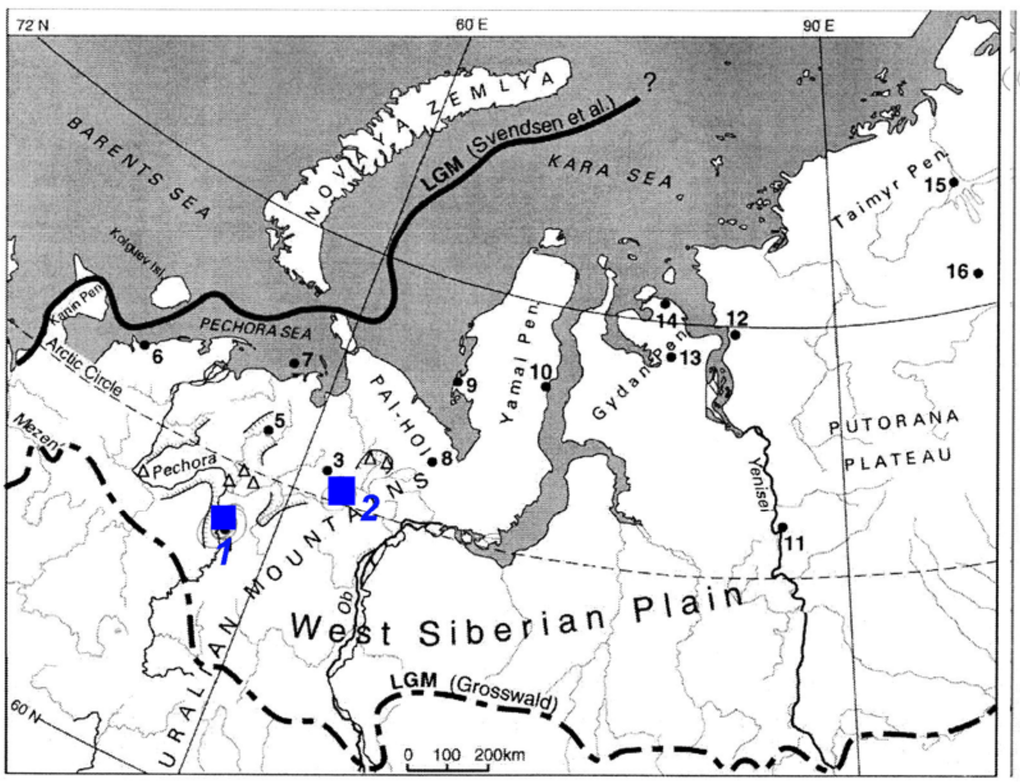

Fig. 2. Eaury Upper Palaeolithic sites in North-Eastern European Russia. 1 – Byzovaya; 2 – Mamontova Kurya. Solis line shows he maximum extansion of the ice-sheet (after Mangerud et al. 2002)

mollusc and a tooth attributable to a modern human.

The sites of a comparable age have been identified in the extreme north-east of East European Plain, close to the Polar Circle (Fig. 2). A series of radiocarbon dates obtained for bones and mammoth tusks from the Byzovaya site, yielded the age in the range of of 25.5-30.0 ka, with one sample showing the age of 33±2 ka [16]. At the site of Mamontovaya Kur'ya still further to the north, bones of large mammals and a few artefacts were found in river-channel deposits. Radiocarbon dated bones yielded the age of 37-35 ka (Pavlov et al. 2001; Mangerud et al. 2002). A group of early UP sites has been found on the Chusovaya River in the western foothills of the Ural Mountains. One of the sites, Zaozer'ye yielded a series of radiocarbon dates in the range of 31.5-30.7 ka (Павлов 2004; Gribchenko 2006).

The so-called 'transitional' industries combining the archaic Mousterian tools with the elements of Upper Palaeolithic technology have been identified at several sites of the East European Plain. These are archaeological layers of several sites in the Kostenki area found beneath the volcanic ash layer, including the layer IVb of Kostenki 14 site mentioned above. They also include the Streletsian industries identified at Kostenki 6, and 11 (layer 5), which age is estimated as 36-32 ka BP (Аникович и др. 2000). The Srteletsian elements were acknowledged at Sungir sites near Moscow and on the River Donets (Biryuchya Balka). In the Crimea archaic elements (of Szeletian type) have been recognised in the later C of Buran-Kaya 3 Cave (Чабай 2000).

Siberia

Mousterian industries were reportedly identified in the Altai Mountains, both in the open-air sites (Kara-Bom and Ust-Karakol-I) and rock shelters (Ust-Kyn, Strashnaya, Denisova, Okladnikov) (Васильев 2000)**.**

The Okladnikov Cave in the Altai Mountains yielded several human teeth and postcranial bones. The teeth are radiocarbon dated to 37750±750 and 43700+1100/-1300 years BP. Turner (1990) diagnosed the premolar from the Okladnikov Cave as similar to those of European Neanderthals. Alekseev (1998) and Shpakova. (Шпакова 2001), on the other hand, found no deviations in their morphology from that of modern humans. Krause *et al***.** (2007) based on recently performed comparison of mitochondrial DNA sequences concluded that that the Okladnilov Cave skeletal remains 'belonged to a population related to European and western Asian Neanderthals'. The problem of attribution of these materials necessitated further examination.

Several sites in southern Siberia yielded the 'transitional' industries which are referred to as 'the initial Upper Palaeolithic' (IUP) (Деревянко и др., 2000; Derevianko 2001; Derevianko & Shunkov 2004). These industries combine the Upper Palaeolithic technology with archaic elements, bone and antler tools and ornaments. These sites dated to 42-25 ka BP have been identified in the Altai Mountains, along the Angara River and in the Bailkal Lake area (Vasil'ev et al. 2002). The sequence of Kara-Bom includes the levels attributed to Mousterian and 'transitional' to Upper Palaeolithic industries, which yielded statistically similar radiocarbon dates: >44 ka and 43200±1500 respectively (Деревянко и др. 2000).

Discussion

There are two basic hypotheses regarding the origins of AMH. The first one known as a 'multiregional evolution' (Wolpoff 1984) is based on the apparent similarity of skeletal remains of *Homo erectus* and *H. sapiens.* Its proponents trace the origins of all modern populations back to an African source, whence it gradually spread over Eurasia. The observable regional variants are viewed as a consequence of environmental differences, emerging through genetic drift and bottlenecking. The second hypothesis known as 'Out-of-Africa' scenario asserts that modern humans evolved comparatively recently from a small population in Africa, which totally replaced the archaic hominids.

Both anthropological and archaeological data substantiated by radiometric evidence visibly support the latter hypothesis. The radiometric age obtained for skeletal remains of early modern humans and related material culture is much older in Africa and the Near East, than anywhere else in the world. The AMH skeletal remains in Ethiopia show the age of 130 - 195 ka (Clark et al. 2003, McDugall et al. 2005). The age of 120-90 ka is attested for samples of South African humans from the Klasies River Mouth (Rightmire, Deacon 2001).

A similar age has also been obtained for early modern human sites in the Near East. The cave sites of Qafzeh and Skhul which contain early forms of *Homo sapiens* yielded the age in the order of 135-100 ka (Valladas et al. 1998; Grün et al. 2005).

Both archaeological and genetic data (Richards et al. 2000) strongly signal the large-scale population expansion of early AMH groups. The existing palaeoclimate records (Scholz et al. 2007) indicate a prolonged period of 'megadroughts' that lasted between 135 and 75 ka and virtually coincided with the initial expansion of AMH. Currently obtained genetic evidence (Behar et al. 2008) suggest an early (90-150 ky BP) divergence of emerging AMH into isolated maternal lineages. In the conditions of adverse environment that triggered a large-scale human displacement 'out of Africa' , the number of these lineages rose to at least 40,m and the overall population dropped to about 4,000 persons.

Another debatable problem concerns the cohabitation and interactions between the populations of AMH and Neanderthals. Differently to *Homo erectus* and *H. sapiens,* Neanderthals most likely developed in Europe where they are acknowledgeable at least since MIS 7. The Neanderthals prolonged coexistence with the AMS in the Near East and Europe is firmly confirmed. Both the ESR and TL dates for Neanderthal sites at Kebara and Amud fall into the range of 50-65 ka. Even younger age (32-33 ka) has been obtained for Neanderthal specimens from Vindija Cave in Croatia (Higham et al. 2006). Neanderthal populations in Europe were always associated with Mousterian industries. Significantly, the early *Homo sapiens* sites in the Near East were equally associated with the 'Levantine Mousterian (of Levallois facies)'. Still more importantly, the both population exhibit essentially similar symbolic behaviour: primitive modern humans were buried at Skhul and Qafzeh, while Neanderthals, at the Tabun, Kebara, Amud and Dederiyeh caves (Bar-Yosef et al. 2000).

The DNA sequencing (Krings et al. 1997; Ovchinnikov et al. 2000) apparently shows that the Neanderthals were a separate lineage or species that did not mix with *Homo sapiens.* This view is contested by Templeton (Templeton 2005), who argues that the 'third out-of-Africa event' was characterised by AMH interbreeding with ancestral populations. This latter view is more in consistence with archaeological evidence.

The assessment of Neanderthals' survival and their possible coexistence with the AMH is closely related to the problem of 'transitional industries'. Such industries combining the archaic technology with UP elements have been recognised in the Near East in the form of Ahmarian (Bar-Yosef et al. 1996). To the same category are classified several assemblages in the Balkans which include cave sites in Bulgaria: Temnata I, stratum IV and Bacho Kiro, stratum 4, with the radiometric age of

43 – 36 ka (Hedges et al. 1994; Kozlowski 2005). The latter site includes artistic manifestations: a plate with incised geometric ornament at Temnata (stratum IV) and perforated animal teeth at Bacho Kiro, stratum 11.

The transitional industries include such entities as Châtelperronian in Western Europe, Uluzzian in Italy, Bohunician in Central and Szeletian in Eastern Europe. All these industries, albeit clearly distinct, share certain common features: the basic Levalloisian technology with the common occurrence of convex backed bladelets. The Châtelperronian in France and northern Spain is unambiguously associated with ornaments, notably, decorated bone tools. The earliest radiometric dates obtained with the use of various dating techniques in various parts of Europe suggest the age in the order of 40-43 ka. Taking into account the possible uncertainty of radiometric dates Kozlowski (2005) suggests that the spread of initial elements of UP technologies occurred in several waves during the time-span of 48 – 38 ka.

To the same category one may classify the Middle Stone Ages (MSA) industries of Africa. On East European Plain the 'transitional' industries are typified by Strreleskian in Kostenki on the River Don and related industries further south. Its elements are acknowledgeable in Early UP industries in the North-East (Mamontovaya Kurya and Zatsenye), and 'Kara-Bom'-type industries in the Altai Mountains (Синицын 2005). All these industries show the combination of archaic and advanced elements in the toolkit; diversified subsistence, evidence of long-range contacts and the occurrence of symbolic objects. In the latter sense the discovery of symbolic objects at Blombos Cave in South Africa's Cape Province is highly significant. The finds include perforated *Nassarius kraussianus* shells and fragments of red ochre with incised geometric design.

Summing up the existing evidence, one might suggest the following scenario of early AMU dispersal (Fig. 3). The initial dispersion of early modern humans in Africa occurred during a hyperarid event in Africa of 135-75 ka BP. The

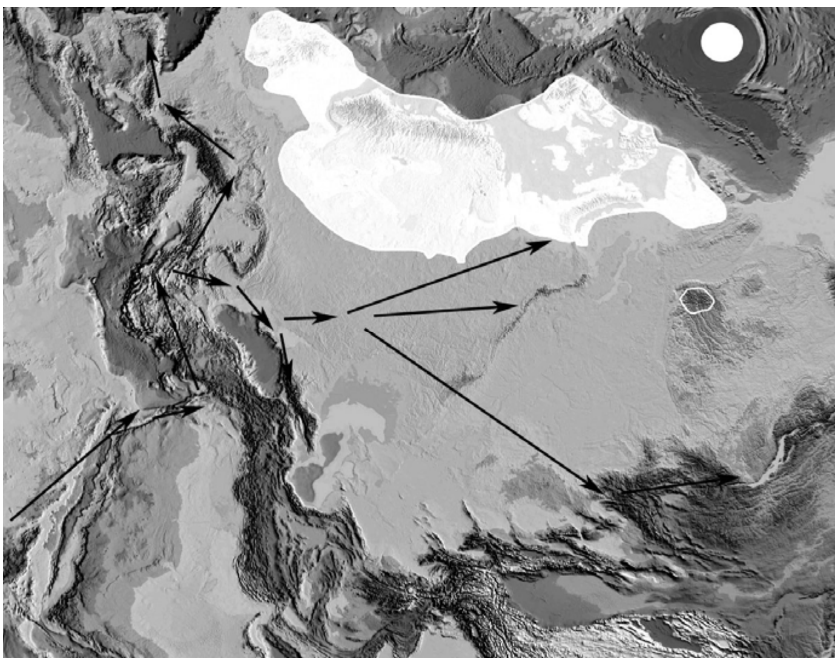

Fig. 3. The trajectories of early AMH dispersal. White areas show the ice-sheets

further expansion from Africa and the Levant proceeded during the dry episode coeval with H6 event, ca 60 ky. It has been remarked that the onset of cold and dry climate in the northern latitudes corresponded to the establishment of a dry and cool climate in monsoon-affected areas of Africa and south-eastern Asia (Abdulkader et al. 2000).

Levant was the most likely area of active interaction and interbreeding between the Neandethals and AMH. This resulted in mutual cultural borrowing: the acceptance of Mousterian technology by modern humans and elements of symbolic behaviour by Neanderthals (burial rite personal ornaments).

In the Balkans the expanding AMH groups divided into two branches, one following into Central and Western Europe, and another to East European Plain. The expansion of modern humans in northern Eurasia including its polar regions and southern Siberia proceeded at a remarkably rapid pace, estimated by Mellars (Mellars 2006) as 0.4 km per year. This rapid expansion occurred during the Middle Weichselian glacial maximum (60-50 ka), coeval with H6 event. This further suggests that at that time the vast areas of northern Eurasia were taken up by uniform 'periglacial' landscape, equally suitable for AMH habitation.

The 'transitional' industries were archaeological manifestations of this rapid AMH expansion. These industries which featured cultural diversity and considerable typological and technological variability developed on the base of an active cultural interaction between the expanding *Homo sapiens* and indigenous populations. One may suggest the presence of the Neanderthals amongst the expanding AMH communities. The mtDNA sequencing of skeletal remains from Okladnikov Cave in the Altai Mountains reportedly demonstrated their affinity to a population 'related to European and western Asian Neanderthals' (Krause *et al.* 2007).

It has been remarked (Davies and Gollop 2003) that although the Neanderthals apparently preferred warmer climatic conditions, there is strong evidence that the spatial patterning of Neanderthals and early AMH was very similar. As it seems, the main causes of Neanderthal extinctions should be sought in the social, cognitive and genetic sphere, AMH forming more copious aggregations with an open gene flow. AMH were much better equipped for the information exchange and symbolic communication as witnessed by the systematic occurrence of symbolic objects and works of art from the very early stages of their existence. In the case of glacial advance, small Neanderthal groups became increasingly isolated and vulnerable to genetic diseases.

Conclusions

1. Early modern humans initially emerged in Africa during a hyperarid event that occurred 135-75 ka.

2. Large-scale AMH expansion in northern Eurasia occurred during the Middle Weichselian glacial maximum (60-50 ka), coeval with H6 event;

3. The expanding human populations culturally and genetically interbred with autochthonous groups (notably, Neanderthals), which archaeologically became conspicuous as 'transitional industries'.

4. The final demise of Neanderthals resulted from their geographical isolation and vulnerability to genetic diseases.

References

Аникович М.В. Хоффекер Дж.Ф., Попов В.В., Дудин Ф.Е., Левковская Г.М., Поспелова Г.А., Кузьмина А.Е., Платонова Н.И., Форман С.Л., Холлидэй В.Т., Картер Б. 2005. Палеолит Костенковско-Брошевского района. Хроностратиграфия многослойной стоянки Костенки 12 (Волховская) в контексте хроностратиграфии палеолита Костенковско-Брошевского района // *Проблемы ранней поры верхнего палеолита Костенковско-Боршевского района и сопредельных территорий* (М.В. Аникович и др., ред.) Санкт Петербург, Копи-Р, с. 66-86.

Васильев С.А.2000. Проблема перехода от среднего к верхнему палеолиту в Сибири // *Stratum Plus*, 2000/1, 178-210.Голованова Л.В., Хоффкер Д.Ф., Харитонов В.М., Романова Г.П., 1998. Мезмайская пещера // *Российская археология*.- 1998.- № 3, 85-98.

Гричук В.П. 2002. Растительность // *Динамика ландшафтных компонентов и внутренних морских бассейнов Северной Евразии за последние 130000* лет (А.А. Величко, ред.). Москва, ГЕОС, с.64-88.

Деревянко А.П., Петрин В.Т., Рыбин Е.П. 2000. Характер перехода от мустье к верхнему палеолиту на Алтае (по материалам стоянки Кара-Бом) // *Археология, этнография и антропология Евразии,* 2 (2): 33-52.

Дроздов Н.И., Чеха В.П., Артемьев Е.В., Хазартс П. 2007. *Археология и четвертичные отложения Куртакского геоархеологического района*. Красноярск, Красноярский педагогический университет.

Павлов П.Ю. 2004. *Ранняя пора верхнего палеолита на северо-востоке Европы*. Сыктывкар, РА Н, Коми научный центр. Научные доклады, вып. 467.

Синицын А.А. 2005. Сходство и различие кара-бомского пласта начального верхнего палеолита восточной Европы // *Актуальные вопросы евразийского палеолитоведения* (А.П. Деревянко и М.В. Шуньков, ред.). Новосибирск, издательство Института археологии и этнографии СО РАН, с. 179-184.

Чабай В.П. 2000. Особенности перехода от среднего к позднему палеолиту в Крыму//*Stratum plus*, т.1, 54-83.

Шпакова Е.Г. 2001. Одонтологические материалы периода палеолита на территории Сибири// *Археология, этнография и антропология Евразии*, т. 4, с. 64-76.

Abdulkader M., Abed A.M. & Yaghan R. 2000. **.** On the paleoclimate of Jordan during the last glacial maximum. *Palaeogeography, Palaeoclimatology, Palaeoecology* v. 160, 1-2, 23-33.

Alekseev V.P. 1998. The physical specificities of Paleolithic hominids in Siberia. In A.P.Derevyanko (ed.) *The Paleolithic of Siberia*. Urbana: University of Illinois Press, p. 329-335.

Anikovich M.V., Sinitsyn A.A., Hoffecker J.F., Holliday V.T., Popov V.V., Lisitsyn S.N., Forman S.L., Levkovskaya G.M., Pospelova G.A., Kuz'mina I.E., Burova N.D., Goldberg P., Macphail R.I., Giaccio B. & Praslov N.D. 2007. Early Upper Palaeolithic in Eastern Europe and implications for the dispersal of Modern Humans. *Science*, v. 315, 223-226.

Bar-Yosef O., Arnold M., Mercier N., Belfer-Cohen A., Goldberg P., Housley R., Laville H., Meignen I., Vogel J.C. & Vandermeersch B. 1996. The dating of the Upper Palaeolithic layers in Kebara Cave, Mount Carmel. *Journal of Archaeological Science*, v. 23/2: 297-306.

Bar-Yosef O. 2000. The Middle and Early Upper Paleolithic in Southwest Asia and Neighbouring Regions. In O. Bar-Yosef, D. Pilbeam (eds), *The Geography of Neandertals and Modern Humans in Europe and the Greater Mediterranean*, Peabody Museum Bulletin 8, Peabody Museum of Archaeology and Ethnology, Harvard University Press, Cambridge, Massachusetts, USA, p. 107-156.

Behar D.M., Villems R., Soodyall H., Blue-Smith J., Pereira L., Metspalu E., Scozzari R., Makkan H., Tzur S., Comas D., Bertranpetit J., Quintana-Murci L., Tyler-Smith C. Wells R. S., Rosset S., the Genographic Consortium. 2008. The dawn of matrilineal diversity. *American Journal of Human Genetics*, v. 82, 5, 1130-1140.

Bond G.,. Broeker W, Johnsen S., McManus J., Labeyrie L, Jouzel L.K., & Bonani G. 1993. Correlation between climate records from North Atlantic sediments and Greenland ice. *Nature*, v. 365, 143-147.

Chabai V.P. 2007. The Middle Palaeolithic and Early Upper Palaeolithic in the Northern Black Sea Region. In V. Yanko-Hombach, A.S. Gilbert, N. Panin and P. Dolukhanov, eds. *The Black Sea Flood Question: Changes in Coastline, Climate and Human Adaptations*. Dordrecht, Springer, p. 279-296.

Clark J.D. 2003. Stratigraphical, chronological and behavioural contexts of the Pleistocene *Homo sapiens* from Middle Awash, Ethiopia. *Nature*, v. 423, 747-752.

Davies W. & Gollop P. 2003. The human presence in Europe during the Last Glacial period II: climate tolerance and climate preference of Mid- and Late Glacial hominids. In T.H. van Andel and W. Davies, *Neanderthals and Modern Humans in the European landscapes during the Last Glaciation: archaeological results of the Stage 3 Project*. Cambridge, McDonald Institute for Archaeological Research, p. 131-146.

Derevianko A.P. 2001. The Middle to Upper Palaeolithic transition in the Altai (Mongolia and Siberia). *Archaeology, Ethnology & Anthropology of Eurasia* 2 (3), 70 -103.

Derevianko A.P., Shunkov M.V. 2004. Formation of the Upper Palaeolithic traditions in the Altai. *Archaeology, Ethnology & Anthropology of Eurasia* 5 (3), 125 -138.

Golovanova, L. V., Hoffecker, J. F., Kharitonov, V. M. & Romanova, G. P. (1999). Mezmaiskaya Cave: A Neanderthal occupation in the Northern Caucasus. *Current Anthropoogy,* v. 40, 77-86.

Goren-Inbar N.& Belfer Cohen A. 1998. The technological abilities of the Levantine Neanderthals, In T. Akazawa, K. Aoki & O. Bar-Yosef. *Neandertals and Modern Humans in Western Asia.* Mew York &London, Plenum Press, p. 205-221.

Gravina B., Mellars P. & Bronk Ramsey C. 2005. Radiocarbon dating of interstratified Neanderthal and modern human occupations at the Chatelperronian type site. *Nature* v. 438, 51-56.

Gribchenko Yu.N. 2006. Lithology and stratigraphy of loess-soil series and cultural layers of Late Palaeolithic campsites in Eastern Europe. *Quaternary International*, v. 152-153, 153-163.

Hedges, R.E.M., Housley R.A., Bronk Ramsey C. & van Klinken G.J. 1994. Radiocarbon dates from the Oxford AMS system: Archaeometry datelist 18. *Archaeometry,* v. 36, 337-374.

Henshilwood C., d'Errico F., Yates R., Jacobs Z., Tribow C., Duller C.A.T., Mercier N., Sealy J.C., Valladas, H., Watts I. & Wintle A.G. 2003. Emergence of modern human behaviour. Middle Stone Age engravings from Southern Africa. *Science*, v. 295, 1278-1280.

Higham T., Bronk Ramsey C, Karavanić I, Smith I.F.H., Trinkaus E. 2006. Revised direct radiocarbon dating of the Vindija G_1 Upper Paleolithic Neandertals. *Proceedings of the National Academy of Science*, v.103 (3): 553-557.

Huijzer A.S. & Isarin R. 1997. Reconstruction of past climate using multi-proxy evidence: an example of the Weichselian pleniglacial in north-western and central Europe. *Quaternary Science Review*, v.16, 513-533.

Huntley B. & Allen J.R.M. 2003. Glacial environments III: palaeo-vegetation patterns in Last Glacial Europe. In T.H. van Andel and W. Davies. *Neanderthals and Modern Humans in the European landscapes during the Last Glaciation: archaeological results of the Stage 3 Projec*t. Cambridge, McDonald Institute for Archaeological Research, p. 79-102.

Kozlowski J.K. 2005. Paléolithique supérieur et Mésolithique en Méditerranée. *L'Anthropologie*, v. 109, 520-540.

Krause J., Orlando L., Serre L.D., Viola B, Prüfer K. M. P., Richards M.P., Hublin J.-J., Hänni C., Derevianko A.P.& Pääbo S. 2007. Neanderthals in central Asia and Siberia**.** *Nature* v. 449, 902-904.

Krings M., Stone A., Schmitz R W. Krainitzki H., Stoneking M,. Pääbo, S. 1997. Neandertal DNA sequences and the origin of modern humans. *Cell* v. 90, 19-30.

McDougall I., Brown F.H. & Fleagle F.G. 2005. Stratigraphic placement and the age of the Modern Humans from Kibish, Ethiopia. *Nature*, v. 433, 733-736.

Mangerud J. Astakhov V. & Svendsen J.-I. 2002. The extent of the Barents-Kara Sea ice sheet during the Last Glacial Maximum. *Quaternary Science Review*, v. 21, 111-119.

Mellars P. 2006. A new radiocarbon revolution and the dispersal of modern humans. *Nature*, v. 429, 931-935.

Mithen S. 1996. *The Prehistory of the Mind. The Cognitive Origins of Art and Science*. London, Thames & Hudson.

Ovchinnikov I., Gotherstrom A., Romanova G.P, Kharitonov V.M., Linden K. & Goodwin W. 2000. Molecular analysis of Neanderthal DNA from the northern Caucasus. *Nature* v. 404, 490-493.

Pavlov P., Svendsen J.I. & Indrelid S. 2001. Human presence in the European Arctic nearly 40,000 years ago. *Nature*, v. 413, 64-67.

Quam, M. & Smith F. H. 1998. A reassessment of the Tabun C2 mandible. In T. Akazawa, K. Aoki, and O. Bar-Yosef, eds. *Neandertals and modern humans in Western Asia.* New York: Plenum Press. p. 405-421.

Rightmere G.P. & Deacon H.J. 1991. Comparative studies of Late Pleistocene human remains from Klasies River, South Africa. *Journal of Human Evolution*, v. 20, 2, 131-156.

Richards M., Macaulay V., Hickey E., Vega E., Sykes B., Guida V., Rengo C., Sellitto D., Cruciani F., Kivisild T., Villems R., Thomas M., Rychkov S., Rychkov O., Rychkov Yu., Stringer C & Andrews P. 1988. Genetic and fossil evidence for the origin of modern humans. *Science* v. 239, 1263-1268.

Scholz C.A., Johnson T.C., Cohen A.S., King J.W., Peck J.A., Overpeck J.T. , Talbot M.R., Brown E.T., Kalindekafe L., Amoako P.Y.O., Lyons R.P., Shanahan T.M., Castañeda I.S., Heil C.W., Forman S.L., McHargue L.R., Beuning, K.R., Gomez J., Pierson J. 2007. East African megadroughts between 135 and 75 thousand years ago and bearing on early-modern human origins. *Proceedings of the National Academy of Science*, v.104, 43, 16415-16421.

Svendsen, J, Alexanderson H, Astakhov V, Demidov I., Dowdeswell J, Funder S, Gataullin V, Henriksen,M, Hjort C, Houmark-Nielsen M, Hubberten H, Ingólfson O, Jakobsson M, Kjær K, Larsen E, Lokrantz H, Lunkka J, Lyså A, Mangerudm J, Matiouchkov A., Murray A, Möller P, Niessen

F, Nikolskaya O, Polyak P, Saarnisto M, Siegert C., Siegert M, Spielhagen R, Stein, R. 2004. Late Quaternary ice sheet history of Northern Eurasia. *Quaternary Science Reviews*, v. 23, 1229-1271.

Turner C.G. 1990. Palaeolithic Siberian dentition from Denisova and Okladnikov caves, Altaiskiy Kray, USSR. *CRP* v. 7, 65-66.

Valladas Y., Mercier N., Joron J.-L., &. Reyss J.-L. 1998. GIF Laboratory dates for Middle Palaeolithic Levant. In T. Akazawa, K. Aoki & O. Bar-Yosef. *Neandertals and Modern Humans in Western Asia.* Mew York &London, Plenum Press, p. 461-482.

Vasil'ev S.A., Kuzmin Y.V., Orlova L.A. & Dement'ev V.N. 2002. Radiocarbon-based chronology of the Palaeolithic in Siberia and its relevance to the peopling of the New World. *Radiocarbon* v. 44/2, 266-275.

Wolpoff M.H., Wu X.Z., Thorne A.G. 1984. Modern *Homo sapiens* origins: a general theory of hominid evolution involving the fossil evidence from eastern Asia. In: F.H. Smith & F. Spencer eds. *The Origins of Modern Humans*. New York, Allan R. Liss, p. 411-484.