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Faculty of Archaeology

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EDITORIAL FOREWORD

On behalf of the editorial board and the administration of the faculty of Archaeology – Fayoum University, we are proud to present the fourth issue of *SHEDET* (the Journal of the Faculty of Archaeology – Fayoum University). With this journal, we are opening a new era of scientific publication of Heritage and Archaeology in Egypt, designed to reach people all over the world, and to be judged according to international standards of excellence.

Presenting the fourth volume of *SHEDET* gives us – in the same context of our three previous volumes– happiness and challenge; happiness in being able to provide our readers with a volume of selected and refereed intellectual contributions, and challenge in trying to sustain this journal and provide publications of international quality. Of course help is needed from scholars and researchers all over the world in the field of heritage and archaeology, to be able to continue and sustain producing this publication. The continuation of this journal is vitally important, as it is one of the very few scientifically peer-reviewed journals dedicated to Archaeology in Egypt

The main scope of the SHEDET Journal is various aspects of ancient Egyptian, Islamic and Coptic archaeology, conservation, museology, and heritage (concerning language, literature, history, art, and related subjects), before the modern period. It aims to publish research that contributes to the enlargement of knowledge or the advancement of scholarly interpretation.

Finally, we would like to thank all contributors to the successful publication of this new journal for their support and collegial collaboration, and express our hopes for more successful issues to come. We must also thank all the editorial team, language editor, and advisory board for all their efforts.

Prof. Dr. Atef Mansour & Prof. Dr. Ahmed Tony

Fayoum, 2017

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DENISOVA CAVE:

A PROMINENT PALEOLITHIC SITE IN NORTH ASIA

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ABSTRACT

Denisova Cave is situated in the Altai region of Siberia (Russia). It contains more than twenty layers of excavated artifacts indicative hominin occupation dating as far back as 280,000 years BP and as recent as the Middle Ages. The archaeological materials from the Pleistocene deposits are some of the most important sources of information regarding the Paleolithic age in Northern Asia. In the Pleistocene layers of the cave a finger bone (2008) was unearthed within stratum 11 belonging to a six or seven year-old unknown hominin girl that dates back roughly between 48,000 and 30,000 years. Later it was established that this bone belonged to a human whose mitochondrial DNA is distinct from the DNA of Neanderthals and anatomically modern humans; it belongs to a new kind of hominins called *Homo sapiens altaiensis* – "Denisovans".

This paper aims to shed more light on the analysis of the materials discovered within the Pleistocene layers of the cave (lithis tools, faunal, and human remains), demonstrating how multidisciplinary research and applying the scientific method in analysing a single site could reveal such unexpected, previously unknown facts, thus casting a new light on Paleolithic life in this region of North Asia.

KEYWORDS

Pleistocene, Denisova Cave, Altai, Upper Paleolithic, homo sapiens altaensis, mtDNA

الملخص

يعتبر كهف دينيسوفا واحداً من أشهر وأهم المواقع التي تعود للعصر الحجري القديم في شمال آسيا، وهو يقع في الجزء الشمالي الغربي من جبال ألتاي بسيبيريا (روسيا)، في أعالي روافد نهر أنوي. يقع مدخل الكهف تقريباً على ارتفاع 30 متر من مستوى سطح النهر ويواجه الجنوب الغربي. كشفت أعمال التنقيب بالكهف عن أكثر من عشرين طبقة حضارية احتوت كل منها على كم كبير من اللقى الأثرية التي تعود إلى فترة زمنية طويلة تمتد ما بين العصر الحجري القديم (منذ 280 ألف سنة مضت) وحتى العصور الوسطى. وتعتبر تلك المادة الأثرية الغنية المكتشفة بالكهف أهم مصادر د ارسة العصر الحجري القديم في منطقة شمال آسيا وآسيا الوسطى.

تم الكشف في الكهف كذلك عن بقايا عظام بشرية مهمة وإن كان أهمها على الإطلاق بقايا أصبع تم العثور عليه عام 2008، والذي قاد العلماء إلى الكشف عن نوع جديد من الإنسان القديم كان معاص ر لإنسان النياندرتال والانسان العاقل (هومو سابينس) وكان يعيش بالمنطقة. تلقي ورقة البحث الحالية الضوء على الدارسة التحليلية للقى الأثرية – الأدوات الحجرية خاصة - وبقايا العظام الحيوانية والبشرية المكتشفة في الكهف، بهدف معرفة طبيعة استخدام الكهف خلال العصر الحجر ي القديم من قبل الإنسان القديم، ولإعطاء مثال حي لأحد المواقع الفردية التي أدت د ارسته عن طريق علوم متعددة وطرق علمية حديثة إلى تغيير نظريات قديمة بل والكشف عن نتائج غير متوقعة، وأثرت معلوماتنا عن الحياة خلال العصر الحجري القديم في منطقة شمال آسيا كلها.

الكلمات الدالة

كهف دينسوفا، بلايستوسين ،ألتاي، العصر الحجري القديم الأعلى، الحمض النووي، هومو سابينس ألتاينسيس.

INTRODUCTION

In the northwestern region of the Altai Mountains in Southern Siberia (Russian Federation) (Fig. 1), important multilayered archaeological sites have been discovered, yielding significant findings/insight on the prehistoric cultures and environmental changes throughout the Pleistocene period.[1] Among these sites is the particularly unique Denisova Cave, located on the upper reaches of the Anui River (Fig. 2.1), considered one of the most important and most well-known pristine archaeological sites in Russia.[2]

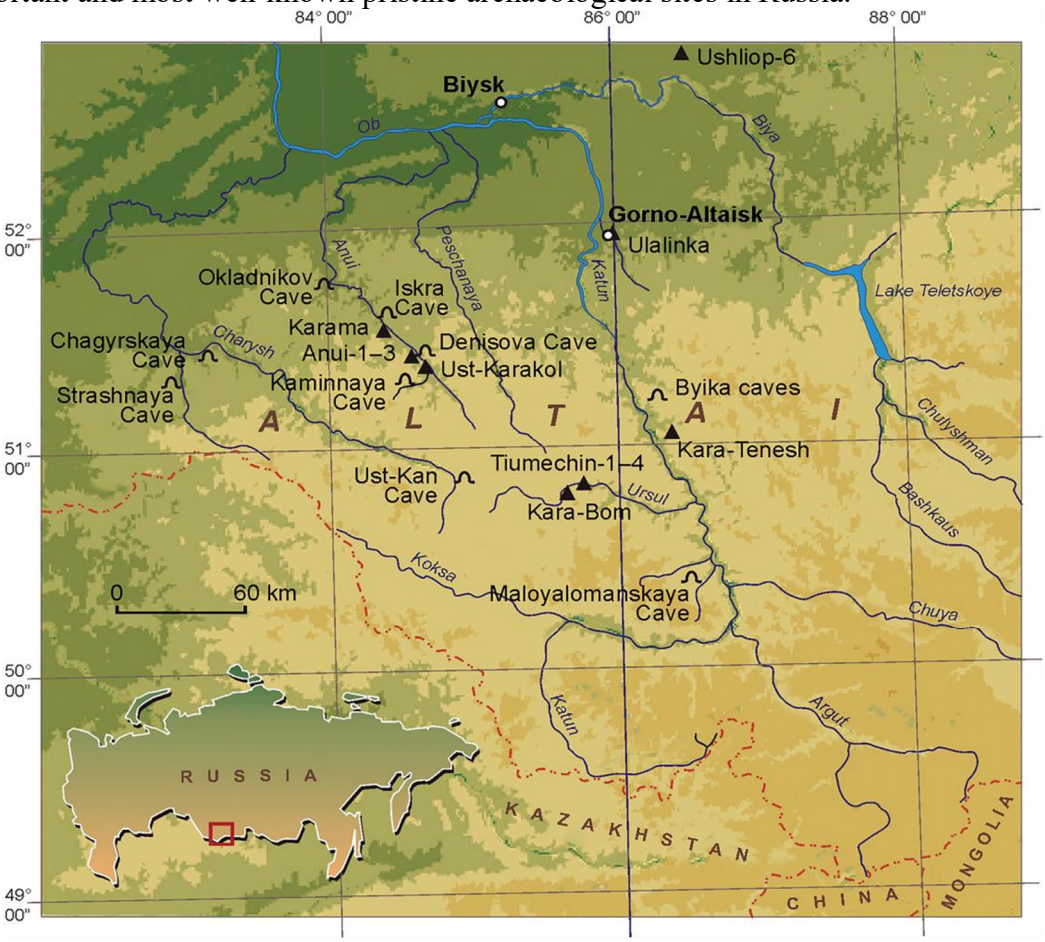


Fig. 1: The Paleolithic sites of the Altai

The cave is situated in a large block of Silurian bioherm sandstone in a vertical cliff facing the southwest approximately 28 meters above the right bank of the Anui River. The elevation of the cave's entrance is approximately 30 meters above the river level. It consists of several short, sub-horizontal and slightly dipping galleries running from a central chamber. Before the excavation work in the cave, the elliptical entrance was (7 x 1.7 m), however during excavation work, and after removing the loose deposits, it became 6 meters high. The entrance leads to the main gallery, which is approximately 7 meters wide and 10 meters long and oriented to the northwest. This gallery opens directly into the cave's Central Chamber (9 x 11 m), which has an arch-shaped ceiling about 10 meters high. There is a niche in the southern part of the Central Chamber's ceiling about one meter in diameter.[3]

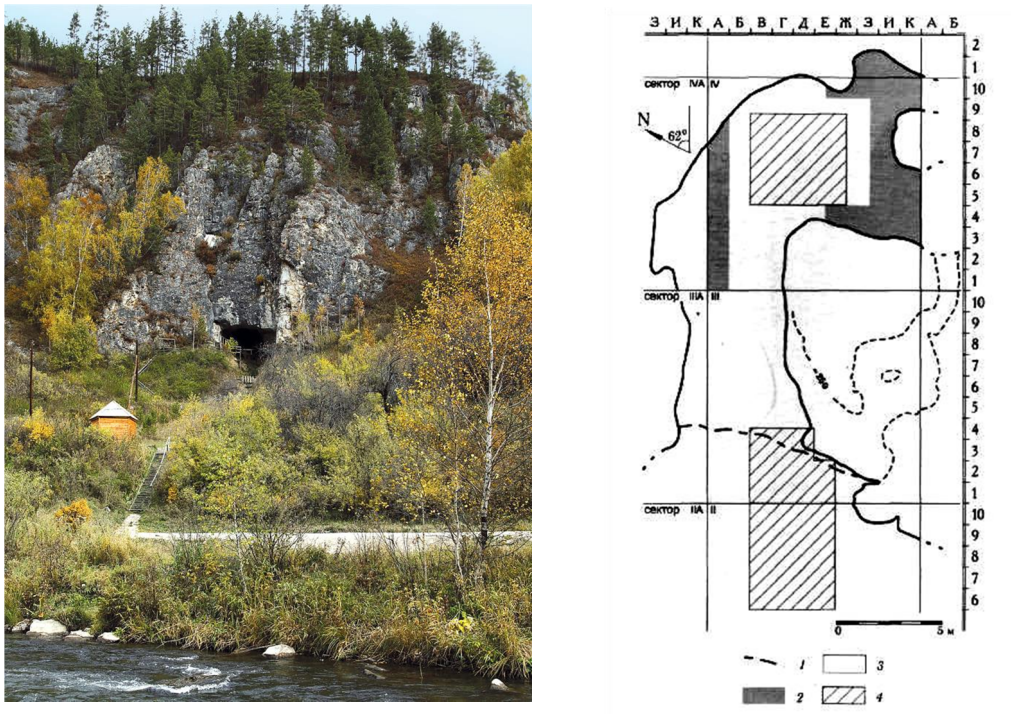
[1] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 35-37.
[2] Derevianko and others, A Paleolithic Bracelet from Denisova Cave, 13.
[3] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 102.

Another three galleries run out from this Central Chamber. The first (9 x 4.5 m) opens to the south west leading to the Terrace Zone (terrace), while the other two galleries (the eastern and the southern) are narrow, dark, and filled with karstic rock (50-70 m) and soft sediment just beyond their entrance. The walls of the cave are smooth and covered with sub-vertical and slanting fissures, which likely determined the structure of the cave.[4] The total cave area is 270 m^2, while the total area of the Central Chamber and main gallery is 120m^2 The total cave volume is 330 m^3, and the latitude and longitude is 51°23'48"N and 84°40'35"E.[5]

In the 18th century, the cave was inhabited by a hermit Dionisij (Denis), which could be where the cave got its name, however it is also said the cave was named after the name of a shepherd "Denis" who settled in the cave to escape bad weather. The indigenous Altay people call it Ayu-Tash, which means "Bear Stone" or "Bear Rock" according to an ancient legend.[6]

The first information about Denisova Cave came from 19th century publications written by Verbitsky, a Russian missionary. In 1926, during his travels through the Altay region – the pearl of Asia – a famous Russian painter, Nikolai Rerikh visited the cave.[6] later in the 1970s and 80s, archaeological investigations were conducted in the cave, which still continues till this day.

After 30 plus years of excavation in the cave, a considerable amount of archaeological findings have been unearthed primarily Pleistocene deposits, which will be analyzed throughout this paper.



A **B**

Fig. 2: Denisova Cave: A- Cave view from Anui River; B- The Cave Plan: 1- drip line, 2- modern surface, 3- Holocene excavation area, 4- Pleistocene excavation area.

[4] Derevianko and others, A Paleolithic Bracelet from Denisova Cave, 13, 14.
[5] Shunkov and Agadjanian, Paleografiya paleolita Denisovoi peshery, 2.
[6] *Denisova peshera, Altai*, 149-150; Denisova peshera, *PRIRODA ALTAYA*, 28; 'Denisovu pesheru nazvali v chest otshelnika Dionisiya', *KOMSOMOLSKAYA PRAVDA*, 2007 26.10.
[7] Roerich, *Altai-Himalaya, A Travel Diary*; Rerikh, *Altai-Gimalai*.

ARCHAEOLOGICAL WORK AND CHRONOLOGY

The first archaeological investigation in the cave took place in 1977 by a Russian paleontologist, Nikolai Ovodov, who opened two trenches in the cave and took the cave measurements for the first time. Then in 1978, the cave was investigated by a group of Russian archaeologists headed by Okladnikov. In 1982, a decision was taken to begin a complex survey of the cave by the Institute of History, Philology and Philosophy of the Soviet Academy of Science (recently Russian Academy of Science – RAN). The systematic excavations have continuously been conducted from 1984 till present day, which are made Denisova Cave the most studied Paleolithic cave in North Asia (Fig. 2.2).[7]

For scientific purposes, a permeant field station[8] – Denisova Cave – was established not far from the cave for studying and analyzing the cave's unearthed materials.

Archaeological investigation of Denisova Cave showed the artifacts from the cave could possibly trace to the period of 280-10 kya.[9] The well-stratified sequence of soft sediment represent the Pleistocene and Holocene epochs. Moreover, the cave layers illustrate a continuous development of cultural traditions until the Late Middle Ages.[10]

Throughout the long periods of excavation, digging was carried out in the Central Chamber, in the entryway (the Terrace Zone), and at the entrances of the southern and eastern galleries. The excavation done in the cave revealed 14 cultural layers some of which several habitation horizons were identified.[11]

The age of these layers according to geochronological data has been determined to be between 282 kya (stratum 22, radio thermoluminscence **[**RTL**]** data) and the Pleistocene/ Holocene boundary.[12]

Age estimates have been carried out using various relative and absolute dating techniques. The earliest layers the RTL dating technique (radio thermoluminescence dating) was used, and for the later layers the C 14 dating method[13] was conducted.

Excavations in each of the above mentioned areas were executed in two stages. First, Holocene sediments designated as strata 0 to 8 were studied; these strata yielded artifacts from Paleo-metal Age up to the Middle Ages.[14] The second stage of excavations focused on the Pleistocene sediment (soft sediment which was excavated until bedrock was reached).[15] The soft Pleistocene sediment in the interior of the cave includes strata 9-22 subdivided into four major periods of human occupation throughout the Paleolithic period. (Fig. 3)

Artifacts from the oldest layer – 22 – most likely refer to the Late Acheulean-Early Middle Paleolithic period – 282 ± 56 kya BP, while the cultural horizons 20-12 refer to the Middle

[7] Mednikova, A Proximal Pedal Phalanx of a Paleolithic Hominin from Denisova Cave, 129.
[8] Derevianko, *The Upper Paleolithic in Africa and Eurasia*, 299.
[9] Derevianko, *The Middle to Upper Paleolithic Transition*, 10.
[10] Derevianko and others, *A Paleolithic Bracelet from Denisova Cave,* 13.
[11] Derevianko, *Recent Discoveries in The Altai*, 106.
[12] Derevianko and others, *Arkheologiya, geologiya i paleografia pleistotsena*, 24-50.
[13] Derevianko and others, *The Pleistocene Peopling of Siberia*, 59, 61, tab. 1.
[14] Derevianko and Molodin, *Denisova peshera.*
[15] Derevianko and others, *A Paleolithic Bracelet from Denisova Cave*, 14.

Paleolithic period, and finally layers 11 and 9 to the Upper Paleolithic.[16]

Biological remains have been recovered providing insight into the environmental and climatic conditions in the region during various stages of the Quaternary.[17]

Fig. 3: Cross-section of the Pleistocene deposits (1), tools and decorations of the beginning of the Upper Paleolithic from horizon 11 (2) in the Denisova Cave

ARCHAEOLOGICAL MATERIAL

In addition to being one of the best studied sites in the Anui River cluster, Denisova Cave contains the most distinct archaeological materials among all the Paleolithic sites of the Altai mountain region, particularly the lithic assemblages.

"Lithic assemblages": *the raw material* - The lithic artifacts of the cave were produced on

[16] Derevianko and others, *The Dynamics of the Paleolithic Industries*, 177.
[17] Derevianko and others, 'A Paleolithic Bracelet from Denisova Cave', 13.

local raw material; pebbles and cobble of sedimentary and volcanic rock from the Anui alluvium (Fig. 4) make up the principal source of raw material. The selection of rocks for manufacturing the tools of Denisova Cave sourced from the banks of the Anui River was purposeful, involving the selection of specific rocks for specific types of tools.[18] Most artifacts of which were made of siltstone or sandstone. A considerable amount of these artifacts were made of effusive rock, while others were made of contact-altered rock.[19]

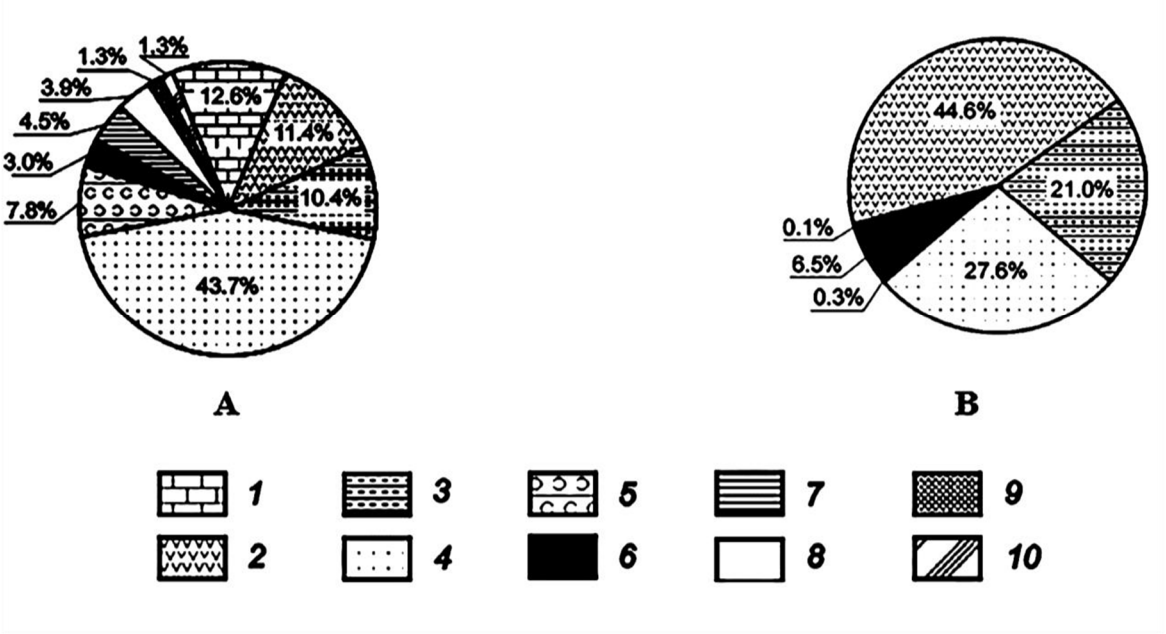


Fig. 4: Pebble materials in Anui River region (A) and in the raw material in Denisova Cave (B). 1. limestones; 2. volcanic rocks; 3. aleurolites; 4. sandstones; 5. gravelites; 6. hornfels; 7. slates; 8. quartz; 9. granite; 10. dike rocks

The Paleolithic inhabitants of Denisova Cave preferred to use their own local material despite the difficulty and effort involved in sourcing the materials and processing them. However, the low quality of raw material was offset by their technical skills and methods which allowed them to adapt successfully to the local conditions.[20]

"Lithic analysis": The archaeological characteristics of the Pleistocene layers in the cave are presented by the materials discovered in 1984 and 1993-1995. The 14 cultural layers identified in the soft Pleistocene sediment of the cave are subdivided into four major periods of human occupation during the Paleolithic period. The lower most strata 22 and 21 have yielded lithic tools of the early Middle Paleolithic period (probably, lithic materials recovered from stratum 22 seem to be older and are dated back to Late Acheulean period). The next strata 20 to 12 have yielded lithic artifacts of the Middle Paleolithic period, whilst strata 11 to 9 are attributed to the Upper Paleolithic period.[21]

Generally, the lithic industries recovered from strata 22 and 21 are characterized by Levallois and parallel strategies of stone reduction; the tool kit is dominated by sidescrapers and notch-denticulate tools.[22]

[18] Anoikin and Postnov, *Features of Raw Material Use*, 55.
[19] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 455.
[20] Anoikin and Postnov, *Features of Raw Material Use*, 56.
[21] Derevianko and others, *The Dynamics of the Paleolithic Industries*, 71.
[22] Derevianko and others, 'A Paleolithic Bracelet from Denisova Cave', 14.

The oldest archaeological materials of the cave were unearthed in stratigraphic horizon 2 of the stratum 22 (22.2); a small collection of artifacts (7 items) including a secondary core bearing negative scars of parallel detachments on the flaking and narrow surfaces, and a racloir reminiscent of the Quina type among others.[23]

The majority of the lithic tools from stratum 22 were discovered in horizon 22.1 (312 artifacts of nuclei, pebbles, blades, flakes, cortical flakes, debris and 40 tools), which were predominantly an assortment of scrapers among other tools.[24] The Levallois tools here are typical Levallios flake and 4 Levallios points, while the rest of the tools are transverse graver of blades, knifes flakes, notched flakes and other tools.[25] (Fig. 5)

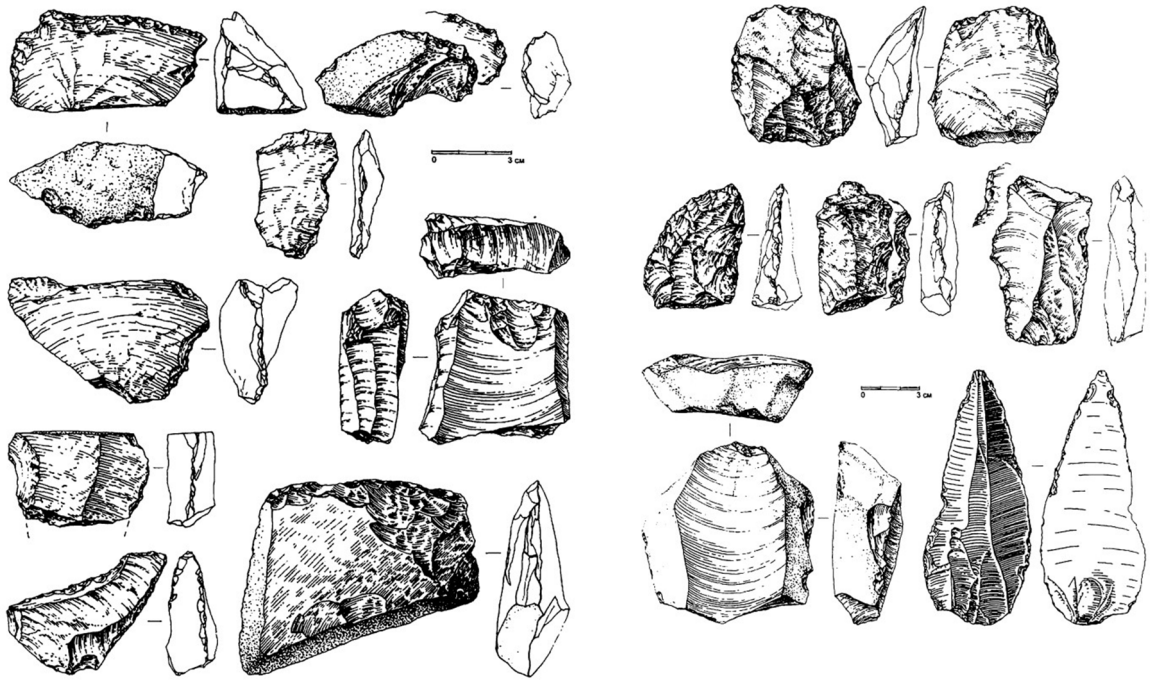


Fig. 5: Stone artifacts from layer 22 in the Central Chamber.

Artifact collection recovered in association with stratum 21 comprises 293 stone artifacts including 24 tools[26] – nuclei, pebbles, blades, flakes, cortical flakes, debris and tools. All the tools were on flakes (scrapers, side-scrapers etc.)[27] with the exception of one chopper on a massive pebble. Blanks were produced through irregular and radial reduction and one single platform core illustrates a parallel reduction strategy. The collection of tools does not include racloirs, an end-scraper, an angle burin, knives with natural backs and backs fashioned on one edge, notch-denticulate forms, spur-like points, a shafted tool, and a chopper. (Fig. 6)

In general, according to composition of the stone tools and their morphological characteristics, the archaeological materials of these strata (22 and 21) most likely can be attributed to the early stage of the Middle Paleolithic period. However, the techno-

[23] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, fig. 56: 5, 8.
[24] Derevianko, *Perekhod ot srednego k verkhnemu paleolitu*, 70, 67.
[25] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, figs. 56: 3; 58: 4.
[26] Derevianko, *Perekhod ot srednego k verkhnemu paleolitu*, 76.
[27] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, fig 59: 2.

typological features of the stone collection of the 22nd stratum suggest its possible attribution to the Late Acheulean period.[28]

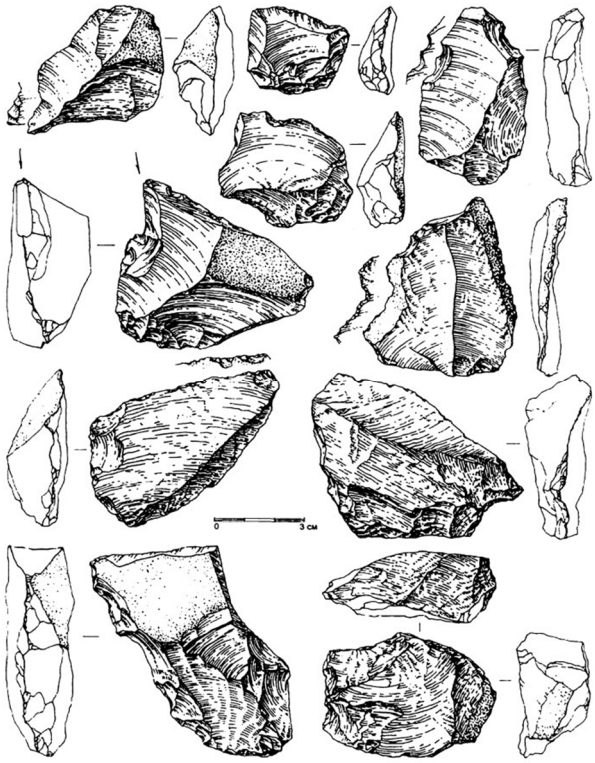
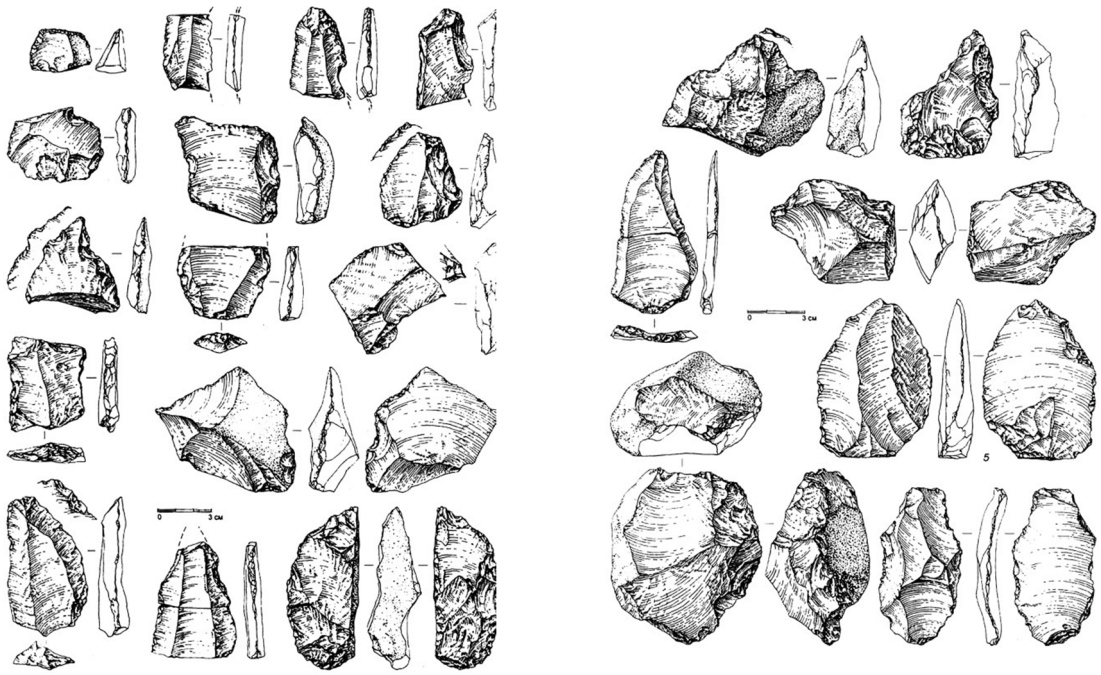


Fig. 6: Stone artifacts from layer 21 in the Central Chamber.



A B

Fig. 7: Stone artifacts from layer 19 (A) and layer 14 (B) in the Cave Central Chamber.

[28] Derevianko, *Perekhod ot srednego k verkhnemu paleolitu*, 76.

In the next strata (20-12), a collection of 7545 artifacts were recovered, that indicate further development of Middle Paleolithic traditions.[29] Most of them were from strata 19 (1760 including 187 tools) (Fig. 7: A), stratum 14 (1484 including 163 tools) (Fig. 7: B), and stratum 12 (2,500 including 284 tools) (Fig. 8). While in other strata much less artifacts were found. Despite the difference in the number of artifacts, all the lithic materials from all the strata have the same techno-typological features. Thus, the Middle Paleolithic materials from strata 19, 14 and 12 are more characteristic than the others[30].

The cores identified within the Middle Paleolithic collection are comprised of a rather rich variety of specimens: cores of parallel reduction pattern predominate, then radial, Levalloisian, narrow-face, and orthogonal varieties of cores.

The basic technical characteristics suggest that this industry could be classified as non-Levallois.[31] Scrapers are the typological basis of these collections, while denticulate tools are the second largest category. The Levallois artifacts are primarily points. The category of Mousterian tools is predominantly scrapers; solitary points are also noted. The share of Upper Paleolithic tools – grattoirs, burins, perforators, truncation spalls – within the relevant collections constitute 14.4 % of artifacts in stratum 19, 10.3% of artifacts in stratum 14, and 16.6% of artifacts in stratum 12.

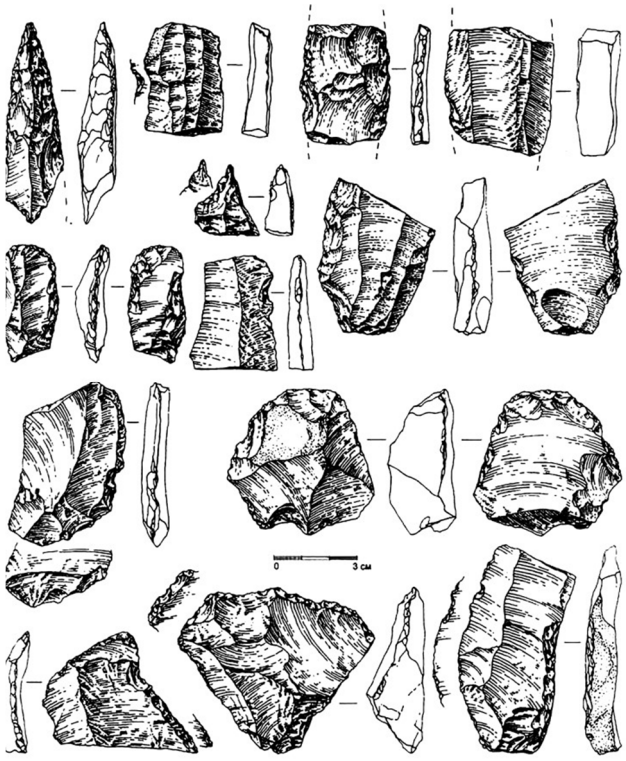
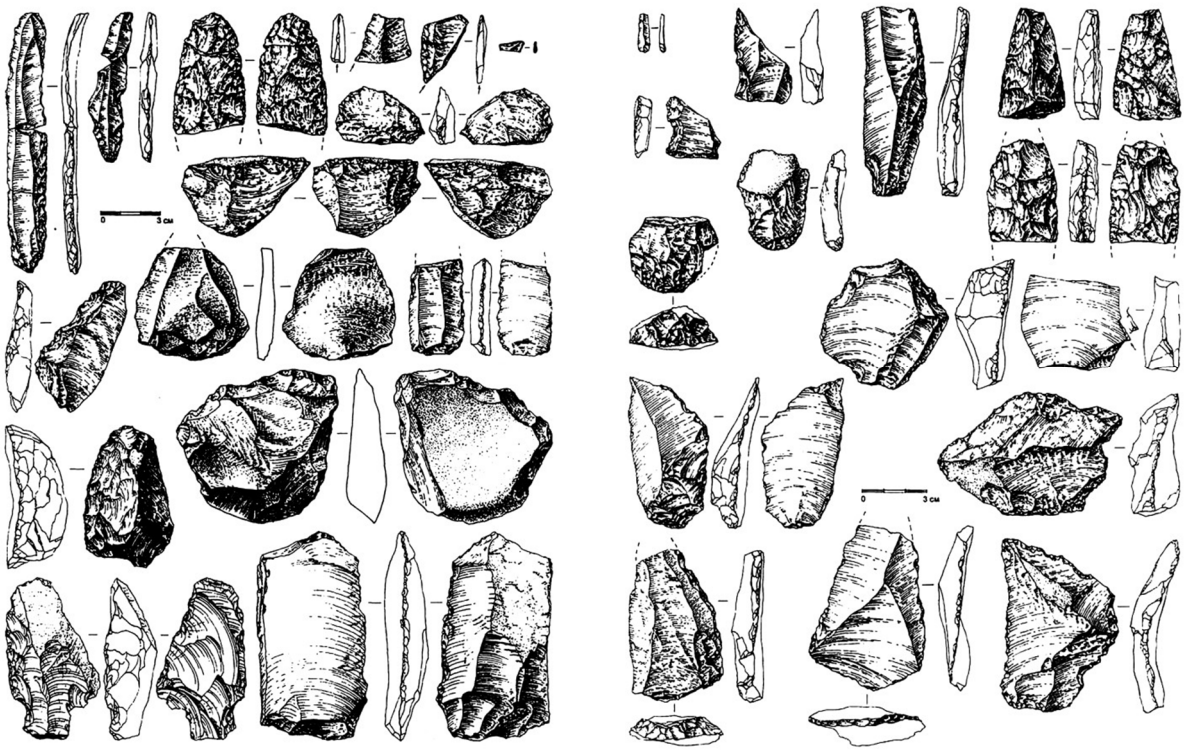


Fig. 8: Stone artifacts from layer 12 in the Central Chamber

Denticulate tools and notches, together with morphologically close beak-shaped tools are the predominant categories of tools in all these strata; 41.5% of the artifacts from stratum 19, 41.1% from stratum 14, and 35.6% from stratum 12. The conspicuous typological features suggest these materials classify as specific variants of the Middle Paleolithic

[29] Derevianko, *The Upper Paleolithic in Africa and Eurasia*, 307.
[30] Derevianko, *Perekhod ot srednego k verkhnemu paleolitu*, 77.
[31] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 456-457.

industry, having a pronounced notch-denticulate, in contrast to the Upper Paleolithic tools, which were largely a combination of Levalloisian and solitary bifacial tools.[32] In the stratigraphic layer 11 a collection of 2611 lithic artifacts including 239 tools were recovered[33] (Fig. 9: A, B). Primary reduction was carried out mostly through the parallel technique, in few cases radial and Levallois flaking strategies were also indicated.



A B

Fig. 9: (A-B) Stone artifacts from layer 11 in the Central Chamber.

The nearly equal proportions of the Mousterian and the Upper Paleolithic tools in the tool kit represent the main characteristic feature of this industry.[34] The Mousterian group are predominantly racloirs. The set of the Upper Paleolithic tools has the greatest percentage ratio in the collection (29.7%), which includes grattoirs, burins, perforators, retouched blades, and backed microblades. Solitary examples of typologically distinct foliate bifaces noted in the collection represent a new characteristic feature of this complex of stratum 11 from Denisova Cave.

The typological composition and the percentage ratio of tool groups allow us to attribute the archaeological collection from stratum 11 to the early Upper Paleolithic. Moreover, the set of tools and adornment pieces recovered from stratum 11 provides additional argument to the Upper Paleolithic attribution of the whole collection from stratum 11.[35]

Near layer 11 two artificial pits were traced which, stratigraphically, are related to the upper level of layer 11. In the filling of these two pits 101 artifacts were recovered, including 83 stone objects, only 12 of which were stone tools.

[32] Derevianko, *The Upper Paleolithic in Africa and Eurasia*, 307-308.
[33] Derevianko, *Perekhod ot srednego k verkhnemu paleolitu*, 77-78
[34] Derevianko, *Perekhod ot srednego k verkhnemu paleolitu*, 78.
[35] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 168.

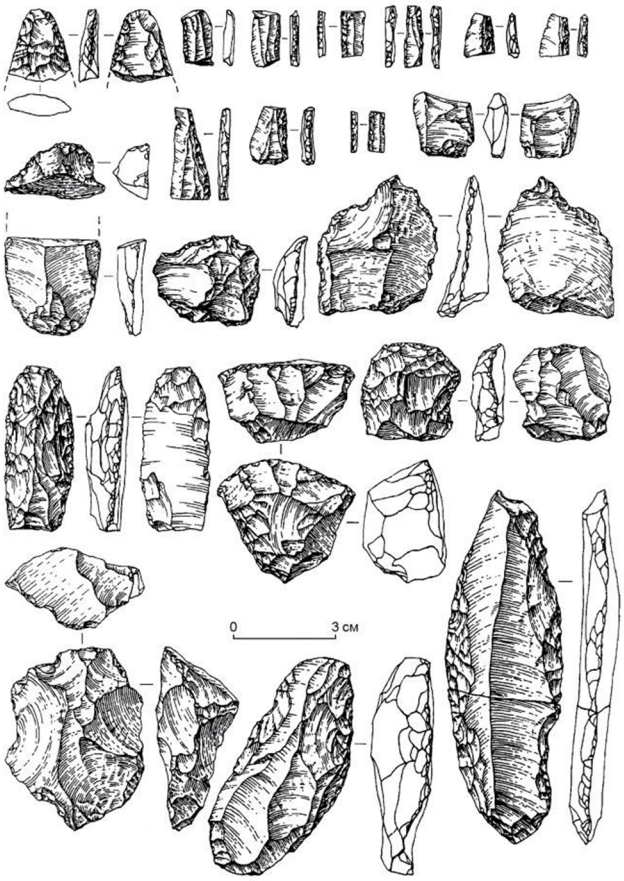


Fig. 10: Stone artifacts from Layer 9 in the Central Chamber.

Stratigraphic layer 9 yielded an Upper Paleolithic collection of 1513 lithic artifacts including 139 tools[36] (Fig. 10). The category of cores comprises prismatic, orthogonal, and radial nuclei; flaking was executed without special preparation of the striking platforms.

Using of blades as blanks for tool manufacturing is a characteristic feature of this industry. The set of backed microblades together with the geometric microlith, a unique find in the Altai Paleolithic, are another unique feature of this industry.

Most tools (55.8%) have been identified as Upper Paleolithic. The proportion of racloirs is considerable and the share of notch-denticulate tools is also great.

Thus, the Paleolithic complex of the Central Chamber in Denisova Cave reflects an evolution of technologies in a wide chronical span across several periods; the Middle and Upper Pleistocene from the early Middle Paleolithic (possibly from Late Acheulean) till the end of Upper Paleolithic.[37]

At the Terrace Zone of the cave, Pleistocene deposits filled the narrow pit (8.5 m deep) formed by sub-vertical walls of bedrock outcrops. The diachronic collection of artifacts recovered from the Terrace Zone of the cave provides evidence for several stages of occupation; the Middle Paleolithic (strata 10 and 9), a transitional period from the Middle to

[36] Derevianko, *The Upper Paleolithic in Africa and Eurasia*, 322.
[37] Derevianko, *Perekhod ot srednego k verkhnemu paleolitu*, 83.

the Upper Paleolithic periods (stratum 8), and during the early Upper Paleolithic (stratum 7) and the second half of the Upper Paleolithic periods (strata 6 and 5).[38]

Comparative analyses of the Middle Paleolithic industries recovered in association with strata 10 (569 artifacts including 63 tools) and 9 (833 artifacts including 120 tools)[39] have displayed many common features. Stone reduction strategies in both industries were based on parallel, Levallois, radial flaking techniques, as well as an apparent predominant parallel technique. Typologically, the industries may be classified as variants of the Middle Paleolithic industry, with a considerable proportion of Levalloisian and notch-denticulate forms. In the case of the collection of stratum 9, the presence of several typologically distinct Upper Paleolithic tools is worth mentioning in this regard.

The artifact collection of stratum 8 is comprised of 1310 specimens which include 124 tools.[40] The primary reduction strategy is illustrated by the parallel; Levallois and radial flaking techniques. In comparison with the industries associated with underlying strata, the tool kit of stratum 8 demonstrates a sharp decrease in the number of Levallois tools. The proportions of the Mousterian and the Upper Paleolithic groups are nearly equal in the collection. The Upper Paleolithic set comprises some morphologically distinct specimens.

The industry from stratum 8 is attributed to the Middle Paleolithic; however, the proportion of morphologically perfect Upper Paleolithic tools is considerable. From the cultural chronological point of view, artifacts from the collection of stratum 8 most likely illustrate the initial stages of the gradual transition from the Middle to the Upper Paleolithic. The lithic industry of stratum 7 comprises 537 artifacts including 86 tools. The proportion of the Upper Paleolithic tools is the greatest and equals 29.6, *grattoirs* being the predominant tool category. A high percentage of notch-denticulate and beak-shaped tools has been noted (38.8%), as well as elements of micro-blade flaking tools. Based on the characteristic features, the archaeological age of the industry of stratum 7 is estimated to be from the early Upper Paleolithic period.[41]

The succeeding stages in the development of the Upper Paleolithic culture are illustrated by the archaeological materials recovered from strata 6 and 5. Stratum 6 yielded 679 lithic artifacts including 75 tools. (Fig. 11) The morphological features of the artifacts indicate a laminar flaking technique in the primary reduction strategy. The well-developed laminar flaking is also suggested by a rather high number of blades, as well as by the presence of microblades in the artifact collection. The Upper Paleolithic collection of stratum 5 comprises 391 lithic artifacts (including 48 tools). This industry demonstrates the further development of technical skills of laminar flaking. The blade number here is the highest of all Paleolithic industries that were identified in Denisova Cave. The Upper Paleolithic tools represent the largest set (42.4%) within the collection of stratum 5. The number of denticulate tools is also rather high (21.2%), the general index for the notch-denticulate tools is close to that of the Upper Paleolithic set.[42]

[38] Derevianko, *The Upper Paleolithic in Africa and Eurasia*, 301.
[39] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, figs. 81 – 87.
[40] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, figs. 88 – 91.
[41] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 462. figs. 92, 93, 96, 97.
[42] Dervianko, *The Upper Paleolithic in Africa and Eurasia*, 322.

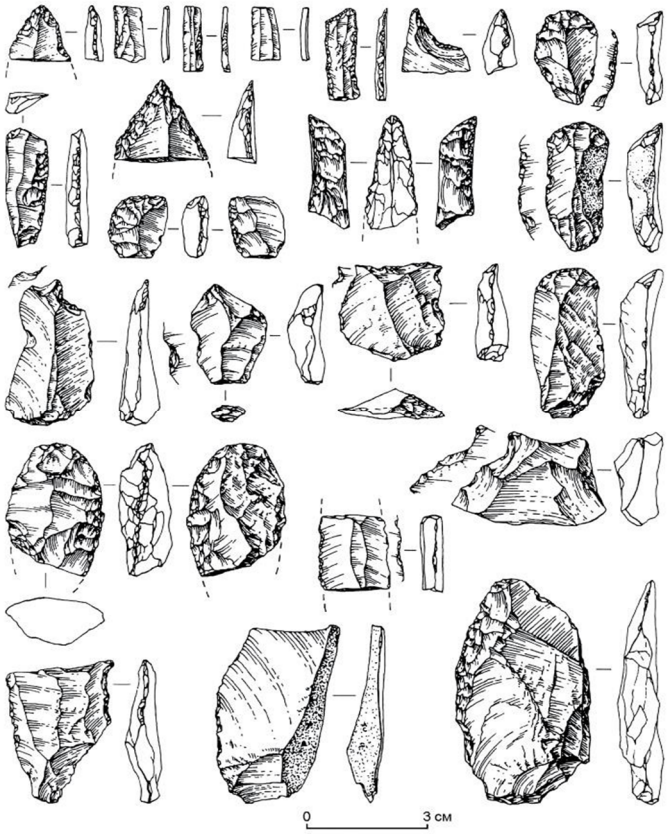


Fig.11: Stone Tool Collection from Stratum 6 of the Terrace Zone.

"Bone implements and personal decoration": The Paleolithic collection of Denisova Cave also contains artifacts reflecting the spiritual and social aspects of early human life; personal body decorations and objects for symbolic activities that were mostly recovered from lithological stratum 11, dating to the Early Upper Paleolithic period and from other layers.

The art collection[43] includes decorations made of bone, mammoth tusk, animal teeth, ostrich egg shells, mollusk shells, and semiprecious stone. (Fig. 12, A)

In layer 11 a collection of more than 60 bone implements (of bone, mammoth ivory and animal teeth) and 5 stone adornments pieces were recovered. They include small eyed needles, a flat object with a broken tip and lines of dots on both surfaces, awls-borers, pendants made of fox, bison and deer teeth showing bi-conical drilled holes, cylindrical (pipe-shaped) beads with annular incisions, small flat beads, and a ring with thin walls, etc.[44] Adornment pieces made of gemstone have also been recovered; pendants made of agalmatolite and pirophillite bearing bi-conical drilled holes, and beads made of pirophillite and shale, adornment made of fresh-water mollusk (Corbicula tibetensis).[45] These bone items and stone ornaments both date to about 50 kya BP.[46]

[43] Derevianko and others, *A Paleolithic Bracelet from Denisova Cave*, 15.
[44] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, fig. 70: 2, 3, 6-14, 19, 22, 24, 25.
[45] Derevianko and others, *The Dynamics of the Paleolithic Industries*, 183-184.
[46] Derevianko, *The Upper Paleolithic in Africa and Eurasia*, 330.

In the artificial pits located near layer 11 a pendant made of a pyrophyllite fragment and 14 bone artifacts, and 3 pendants of animal teeth and mammoth ivory beads were unearthed. 8 bone implements made of bone and animal teeth including eyed needles, borers, pendants made of deer teeth, and tabular pieces with artificial perforations [47] were found in layer 9.

Layer 6 had 4 bone implements, and 3 flat beads, and rings made of ostrich eggshell, a unique material for the Altai Paleolithic classified as adornment pieces.[51] Layer 5 had 6 bone implements; needle fragments, a borer, a stem of a combination tool, and a large thrusting tool.

Regarding the art artifacts, fragments of a stone bracelet made of dark green chloritolite dated back to 30 ka BP (Fig. 12, B) were particularly striking. The fragments were recovered from the upper portion of the Pleistocene deposits within the entrance zone of the eastern gallery, in the lowermost portion of the stratigraphic layer 11.1, 0.75 m from one another.

The bracelet is indicative of a spiritual culture of Upper Paleolithic people, and also boasts their production and technological prowess.[48].

A **B**

Fig. 12: A- Bone implements and stone decorations from layers 9 and 11 in the Central Chamber of Denisova Cave; B- A Paleolithic bracelet from Denisova Cave: Exterior (*1*), interior (*2*), superior (*3*), and inferior (*4*) views of the bracelet

The bracelet is 27 mm wide and 9 mm thick, and the diameter of the complete object seems to be about 70 mm. The bracelet has a biconic drilled opening up to 8 mm in diameter close

[47] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation,* fig. 70: 17, 20, 26.
[51] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, figs. 94 – 96.
[48] Derevianko and others, *A Paleolithic Bracelet from Denisova Cave.*

to one of the fractured ends. Initial observations suggest that the bracelet surface exhibits traces of being subject to various abrasive tools and signs of use-wear.[49]

Detailed use-wear and technological analyses of the bracelet have shown that the item was manufactured with the help of various technical methods of stone working including methods not stereotypical of the Paleolithic period, which include rubbing with the help of various abrasive materials and polishing with skin and hide.[49]
This abundance of archaeological material from the Pleistocene deposits at Denisova Cave from such a significantly long period of time is one of the most important sources of information about the Paleolithic period of North and Central Asia.

FAUNAL REMAINS

In total, approximately 120,000 big and medium sized mammal bone fragments were studied, however only a small fraction were fully identified. The main part of the collection comes from the Central Chamber of the cave – 90,567 fragments of fossilized bones (from 1993-1995 excavations). 28 280 bone remains (from excavations of 1989, 1991, 1996)[50] were collected from the Terrace Zone of the cave.

All animal remains are heavily fractured and hardly any complete teeth or bones were recovered. The length of the largest fragments from the Central Chamber and the Terrace Zone do not exceed 18.5 cm.[51]

As a result, a rich collection of bones of Pleistocene animals were recovered from the soft sediment of the Central Chamber. The total list also includes about 140 taxa. Skeletal remains of large animals are classified into 27 taxa.[52] Remains of animals inhabiting steppe regions predominate the collection by the variety of taxa and amount of bones (*Vulpes corsac*, *Mustela eversmannii, Ursus rossicus, Crocuta spelaea, Coelodonta antiquitatis, Equus hydruntinus, Poephagus mutus, Bison priscus, Procarpa gutturosa, Saiga tatarica, Ovis ammon*). Skeletal remains of certain taxa inhabiting forest-steppe (*Cuon alpinus, Equus ferus, Cervus elaphus*) and rocky (*Mustela altaica, Capra sibirica*) ecozones were also recorded. Bones of forest animal species (*Martes zibellina, Ursus arctos, Lynx lynx, Capreolus pygargus*) were found throughout the whole profile with the exception of stratum 9. Strata 22, 19, and 12-9 revealed solitary bones from tundrataiga ecozones (*Alopex lagopus, Mustela erminea*). The noted taxa composition of the teriofauna establishes the co-existence of various ecozones characteristic of the mountain regions in the past. The distribution of bones by lithological strata reveals a predominance of mammals of open ecozones and a gradual decrease in the concentration of forest species from bottom to top.

The taxonomic list of small vertebrata (excluding birds) includes approximately 50 taxa, of which more than 40 taxa represent small mammals.[53] Artifacts typical of dry and high-elevated steppes such as *Stenocranius gregalis* and *Alticola strelzovi* are predominant, followed by *Lagurus*. All lithological strata yielded remains of field voles of the

[49] Derevianko and others, *Issledovaniya v vostochnoi galeree Denisovoi peschery*, 100 – 105.
[49] Derevianko and others, *A Paleolithic Bracelet from Denisova Cave*, 24.
[50] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 206.
[51] Derevianko, *The Upper Paleolithic in Africa and Eurasia*, 489.
[52] Akimova and others, *Arkheologiya, geologiya i paleogeografiya*,1990; Jermonpre, *Predvaritelnye rezultaty tafonomii*, 13; Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 451452, tab. 26.
[53] Agadjanian and others, '*Problemy vzaimootnoshenii pervobytnogo cheloveka*, 444-449, tab. 1.

Clethrionomys family, are typical of forest biotas. Bones belonging to the families of *Asioscalops* and *Myospalax myospalax* were also recovered from virtually every stratum; species are burrowing animals, which could not survive deep-freezing soils. Considerably high concentrations of remains of steppe and nival species suggest the existence of open areas. Furthermore, occurrences of *Clethrionomys* remains and *Sciurus, Pteromys* and *Eutamias sibiricus* bones establishes that there was permanent existence of forest massifs. Forest taxa predominate the bone collection associated with stratum 22. The number and diversity of steppe species bones gradually increased from the bottom strata to the top, reaching their maximum in strata 12-9.

66 taxa have been identified within the bird bone collection.[54] The ornitofauna are generally characterized by the presence of Alpine steppe species. Remains of taxa indigenous to highlands predominant in the collection, of which *Leucosticte arctoa*, *Lagopus lagopus*, and *Plectrophenax nivalis* are the most numerous. Forest birds do not figure as much both in number and in diversity of species.

The Terrace Zone yielded an abundant collection of bones.[55] A total of 21 taxa of large mammals have been identified: Carnivora/*Alopex lagopus, Vulpes corsac, Vulpes vulpes, Canis lupus, Ursus arctos, Ursus rossicus, Martes zibellina, Mustela eversmannii, Crocuta spelaea, Panthera spelaean*, Proboscidea/*Mammuthus, primigenius,* Perissodactyla/*Coelodonta antiquitatis, Equus hydruntinus, Equus ferus,* Artiodactyla/*Capreolus pygargus, Cervus elaphus, Bison priscus, Procapra gutturosa, Saiga tatarica, Capra sibirica,* and *Ovis ammon*. The recovered bones were unequally dispersed over the profile hampering comparisons of taxa composition by lithological layers. However, bone collections of species from open space biotopes predominate bone collections associated with all lithological layers in number and in composition variety.
The taxonomic list of small vertebrata (excluding birds) identified within the collection includes 39 taxa, 34 taxa of which represent a small mammal community.[56] The microterriofauna composition is dominated by field voles; *Stenocranius gregalis*, *Alticola strelzowi*, and *Clethrionomys rutilus*. Remains of *Spermophilus undulatus*, *Myospalax myospalax*, *Ochotona*, and *Asioscalops altaica* make up a considerable proportion on the bone collection. A lesser share of *Sorex*, *Ellobius*, and *Marmota* have been noted in all lithological layers; there is also a presence of solitary specimens of *Apodemus*, *Arvicola*, and *Lemmini*.

The list of birds identified in association with this site includes 34 taxa, the most numerous being *Lagopus lagopus* bones.[57]

The cut marks on the bones of large and small ungulates indicate some of these animals were prey for Paleolithic hunters. High fragmentation of bones made it impossible to provide a detailed account of the skeletal elements of ungulates from cave deposits. Among the remains of large and small ungulates, in addition to teeth and their debris, fragments of long and flat bones, as well as short bones of distal limbs, are most common. In layer 6 in the Terrace Zone, short bones make up 40% of all remains (except teeth), and in layers 7-10 they account for more than 50%. No significant changes in the number of short bones (39-42%) were observed in the Central Chamber, however in layers 20-22 it increased to 55%.

[54] Jermonpre, *Predvaritelnye rezultaty tafonomii,* 14.
[55] Akimova and others, *Arkheologiya, geologiya i paleogeografiya*, 55.
[56] Jermonpre, 'Predvaritelnye rezultaty tafonomii', 14.
[57] Akimova and others, *Arkheologiya, geologiya i paleogeografiya*, 60.

Among the large ungulates (bison/horses), the proportion of short bones is 22-24%, whereas medium and small ungulates range from 59-60%.[58]

These results suggest small ungulates were brought to the cave mainly in the form of whole carcasses or large pieces, whereas large ungulates were likely dismembered outside the cave; low-value, distal limbs infrequently found themselves in the cave.[59]

ANTHROPOLOGICAL FINDS

The anthropological materials discovered in Denisova Cave's soft Pleistocene sediment are the most important finds in the whole cave. The first materials unearthed during the excavation work in 1984 were two human bone remains.[60] According to Shpakova (2001),[61] they were teeth derived from two different individuals. Stratum 22.1 revealed m_2 of a 7-8 years old child, and another[1] of an adult was recovered in association with layer 12.

According to C. Turner's findings, human teeth from Denisova Cave display well-pronounced features of the Neanderthal odontological complex of the European, in contrast to their Asian counterparts, *Homo sapiens neandertalensis.*[62] However, V. Alekseev argues that the scant anthropological material prevents researchers from unequivocally classifying these findings as Neanderthal; the noted physical morphological features suggest that these remains are that of modern humans.[63] Additional examinations of morphological features argue in favor of the hypothesis that the fossils derive from early anatomically modern *Homo sapiens*, despite certain archaic traits noted.[64]

More anthropological materials were discovered in stratum 11; a cranial fragment, teeth, and postcranial fragments.[65] In 2000, a hominin tooth from a young adult was discovered in layer 11.1 of the south gallery of Denisova Cave. In 2008, the distal manual phalanx of a juvenile hominin was excavated at Denisova Cave. The phalanx seven-year-old girl was found also in layer 11,[66] and therefore from another individual than the tooth which stems from an adult.

The results of sequencing the nuclear genome from both the tooth and the phalanx showed that they belong to different individuals. However, they are from the same hominin population, which were totally unknown before. This new population differed from *Homo sapiens* and *Homo neandertalensis.*[67] This taxon was named "Denisovan", or *Homo sapiens altaiensis*.[68]

The Denisovians and Neanderthals originated from a common ancestral population.[69] Based on these results, Denisovans and Neanderthals were sister groups, whose most recent

[58] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 265-266.
[59] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 266
[60] Derevianko and others, *Paleoinvironment and Paleolithic Human Occupation*, 155.
[61] Shpakova, *Odontologicheskie materialy perioda paleolita*, 2001
[62] Turner, *Physical Anthropology in the U.S.S.R*, 4 – 6; Tuner, Paleolithic Teeth of the Central Siberia, 239 – 243; Tuner, *Paleolithic Siberian Dentition*, 65 – 66.
[63] Alekseev, *The Physical Specificities of Paleolithic Hominids in Siberia*, 329 – 335.
[64] Shpakova, *Odontologicheskie materialy perioda paleolita*, 65-76
[65] Derevianko, *Recent Discoveries in the Altai*,113, figs. 35-36.
[66] Reich and others, *Genetic History of an Archaic Hominin Group*, 1053-1058.
[67] Reich and others, *Genetic History of an Archaic Hominin Group*.
[68] Derevianko and others, *The Dynamics of Paleolithic Industries* 209.
[69] Reich Genetic History of an Archaic Hominin Group, 1055.

common ancestor lived 640 ka BP. The common ancestors of the Denisovans and Neanderthals have possibly migrated from Africa to the Near East before 800 ka BP. About 600 ka BP, some Near Eastern populations, speculated to be ancestors to *Homo heidelbergensis*, migrated from the Near East to other regions of Eurasia.[70]

There was no introgression of genes from the Denisovans to modern Eurasians, while a portion of their genetic material (4–6 %) was borrowed by some populations of the Southeast Asia. They spread across a wide territory in geographical and ecological respects; from the Siberian larch forests to the tropics.[71]

The Denisovan genome was discovered among the Australians, Papuans, Melanesians, Polynesians, Negritos, Mamonwa people and the Yingju populations (Southern China).[72]

In 2010, another hominin bone, this time a proximal toe phalanx, was recovered in the East Gallery of Denisova Cave, found in the lowest sublayer 11.4. The phalanx comes from the fourth or the fifth toe of an adult individual and its morphological traits link it with both Neandertals and modern humans. In other words, specimens from two different mtDNA clades were found in Denisova Cave.[73]

Thus, modern humans overlapped in time and space with other hominins[74], in our case analyses of the Neandertal and Denisovan genomes revealed that gene flow occurred between these archaic hominins and the ancestors of modern humans.[75]

CONCLUSION

Long-term, systematic, and multidisciplinary research in well stratified Denisova Cave in the Anui Valley, in the northwestern Altai Mountains, using archaeological, lithostratigraphic, and paleontological methods, has made it possible to trace the evolution of the of Paleolithic culture/traditions, and to reconstruct the paleo-environment over a considerable period in the whole region.

Being the best studied site in the region, the archaeological material unearthed in the cave are the most representative, and yielded the longest sequence among the archaeological sites (either caves or open-air sites) discovered so far in Siberia (280-10 kya).

According to the techno-typological features of the stone collection from the earliest stratum (22), it is reasonable to assume that the cave was occupied for the first time by archaic humans (erectoid forms) with late Acheulean industry approximately 300 kya, connected with the repopulation of the Altai region at this time by migrants form the Near East whose industry was characterized by Levallois and the parallel flaking technique. They could possibly belong to Homo erectus, Homo heidelbergensis, or another species, but they ultimately were ancestors of Homo sapiens altaiensis (Denisovans). Thus, continuous development of Middle Paleolithic stone industries, and subsequently, of physically modern humans was happening locally in the Altai region.

[70] Derevianko and Shunko, *Anthropogenesis and Colonization of Eurasia*, .68.
[71] Reich and others, *Denisova Admixture and the First Modern Human Dispersal*, 523.
[72] Derevianko and others, *The Dynamics of the Paleolithic Industries*, 188-189.
[73] Prüfer and others, *The Complete Genome Sequence of a Neandertal from the Altai Mountains*, 43
[74] Vattathil and Akey, *Small Amounts of Archaic Admixture*.
[75] Vernot and others, *Excavating Neandertal and Denisovan DNA*, 1.

The Paleolithic inhabitants of Denisova Cave, apparently, successfully adapted themselves to the local environmental conditions using local raw material even it was of low quality, indirectly indicating that they had enough skill and technically efficient methods to manufacture it.

The Middle Paleolithic industry was developed in the period between 100 and 60 ka BP, followed by a transitional period to the Upper Paleolithic industry. The gradual developmental process of the Upper Paleolithic industry started from 60 ka BP, the evolvement of which was based on blade flaking.

The main stone tool types of the Upper Paleolithic appeared in the interval between 50 and 40 ka BP, with specific decorations made of stone, subjected to drilling and polishing, and bones and animal teeth which were used to produce various tools and decoration items.

The Upper Paleolithic industry, which evolved in the Altai, is one of the oldest and unique in Eurasia. The entire process was happening on a local base.

Chronologically, the collection of bone tools and personal ornaments in Denisova Cave is the earliest and the most representative assemblage of their kind from the Paleolithic collections from North, Central and East Asia.

In the Denisova Cave, the paleoanthropological remains of the creators of this unique Upper Paleolithic culture were found. The DNA-sequencing determines that this population differed both from modern humans and from Neanderthals. This taxon was named "Denisovan", or *H. sapiens altaiensis*.

Abundant faunal remains unearthed in the cave and the cut marks on them indicate that hunting was the leading economic activity in Denisova Cave, whereas foraging was secondary, as poor vegetative resources could not have provided substantial food supply especially during the wintertime.

Thus, Denisova Cave probably served as a long-term camp site (but not permeant) for Paleolithic people and at the same time as a lair for predators (according to cut marks on the animal bones).

To conclude, the Denisova Cave site is the best example of how multidisciplinary research, and applying scientific methodologies in studying findings in a single site could reveal such unexpected, previously unknown facts, and change the picture of Paleolithic life in this region of North Asia.

REFERENCES

- Agadjanian (A. K.) and others, 'Problemy vzaimootnoshenii pervobytnogo cheloveka i pripodnoi sredy na primere Severo-Zapadnogo Altaia', in *Ekologiya i biosfery i bioraznoobraziya 4: paleoekologiya i evoluciya soobshestv,* Paleontologicheskii institut RAN, Moscow 2006, 439-459.
- Akimova (E. V.) and others eds., *Arkheologiya, Geologiya i paleogeografiya paleoliticheskikh pamyatnikov yuga Srednei Sibiri (Severo-Minusinskaya vpadina, Kuznetskii Alatau i Vostochnyi Sayan)*, Krasnoyarsk 1992.
- Alekseev (V.), 'The Physical Specificities of Paleolithic Hominids in Siberia', in *The Paleolithic of Siberia. – Urbana*, Chicago, Univ. of Illinois Press 1998, 329 – 335.
- Anoikin (A. A.) and Postnov (A. V.), 'Features of Raw Material Use in The Palaeolithic Industries of the Mountains Altai, Siberia, Russia', *INDO-PASIFIC PREHISTORY ASSOCIATION BULLETIN* 25/3 (2005), 49-56.
- *Denisova peshera, Altai*: Putevoditel, 1999.
- Denisova peshera, *PRIRODA ALTAYA 11/12* (2007), 28.
- Denisovu pesheru nazvali v chest otshelnika Dionisiya, *KOMSOMOLSKAYA PRAVDA* 26.10 (2007).
- Derevianko (A. P.) and Molodin (V. I.), *Denisova peshera*, part 1. Novosibirsk 1994.
- _____, 'Perekhod ot srednego r verkhnemu paleolitu na Altae', *ARCHAEOLOGY, ETHNOLOGY AND ANTHROPOLOGY OF EURASIA* 3/7 (2001), 70–103.
- _____, *The Middle to Upper Paleolithic Transition and Formation of Homo sapiens in Eastern, Central and Northern Asia*, Novosibirsk 2002.
- _____, 'The Upper Paleolithic in Africa and Eurasia and the Origin of Anatomically Modern Humans', in *International Symposium "Features of the Upper Plaeolithic Transition in Eurasia: Cultural Dynamics and Evolution of the Genus Homo' Denisova Cave, the Altai, 4-10 July 2011*, Novosibirsk 2011
- _____, *Recent Discoveries in the Altai: Issues on the Evolution of Homo sapiens*, Institute of Archaeology and Ethnograpgy Sb RAS Press, Novosibirsk 2012.
- Derevianko (A. P.) and others, *Paleoinvironment and Paleolithic Human Occupation in Gorny Altai: Subsistence and Adaptation in the Vicinity of Denisova Cave***,** Institute of Archaeology and Ethnography SB RAS Press, Novosibirsk 2003.
- Derevianko (A.P.) and others, "Issledovaniya v vostochnoi galeree Denisovoi peschery", *PROBLEMY ARKHEOLOGII, ENTOGRAFII I ANTROPOLOGII SIBIRII I SOPREDELNYKH TERRITORII* 11/1 (2005), Novosibirsk, 100 – 105.
- Derevianko (A. P.) and others, 'The Pleistocene Peopling of Siberia: A Review of Environmental and Behavioral Aspects', *INDO-PASIFIC PREHISTORY ASSOCIATION BULLETIN* 57 (2005), Pp. 69-77.
- Derevianko (A. P.) and others, 'A Paleolithic Bracelet from Denisova Cave', *ARCHAEOLOGY, ETHNOLOGY AND ANTHROPOLOGY OF EURASIA* 34/2 (2008), 13-25.
- Derevianko (A. P.) and others, *Arkheologiya, geologiya i paleografia pleistotsena i golotsena Gornogo Altaya*, Novosibirsk 1998.
- Derevianko (A. P.) and others, *The Dynamics of the Paleolithic Industries in Africa and Eurasia in the Late Pleistocene and the Issue of the Homo Sapiens Origin*, Novoribirsk 2014.
- Geniatulin (R. F.), *Malaya enciklopedia Zabaikaliya. Arkheologiya*. Novosibirsk. 2011.
- Jermonpre (M.), 'Predvaritelnye rezultaty tafonomii Denisvoi peshery (po materialam rskopok 1992 g.)', *ALTAICA* 2 (1993), 11-16
- Mednikova (M. B.), 'A Proximal Pedal Phalanx of a Paleolithic Hominin from Denisova Cave, *ARCHAEOLOGY, ETHNOLOGY AND ANTHROPOLOGY OF EURASIA* 39/1 (2011), 129-138.

- Ovodov (N. D.), 'Pozdneantropogenovaya fauna mlekopitaushikh (Mammalia) ugo Ussuriiskogo kraya', in *Fauna i Sistematika pozvonochnykh Sibiri,* Novosibirsk. 1977, 157-177.
- _____, 'Peshernye mestonakhojdeniya ostatkov mlekopitaushikh Sibiri i Dalnego Vostoka (kratkii obzor)', in *Karst Dalnego Vostoka i Sibiri*, Vladivostok 1980, 145-163.
- Reich (D.) and others, 'Denisova Admixture and the First Modern Human Dispersal into Southeast Asia and Oceania', *THE AMERICAN JOURNAL OF HUMAN GENETICS* 89 (2011), 516–528.
- Reich (D) and others, 'Genetic History of an Archaic Hominin Group from Denisova Cave in Siberia', NATURE 468 (2010), 1053-1060.
- Rerikh (N. K.), *Altai-Gimalai*, Moscow 2001.
- Roerich (N.), *Altai-Himalaya, A Travel Diary*, New-York 1929.
- Shpakova (E. G.), 'Odontologicheskie materialy perioda paleolita na terretorii Sibiri',
- *ARCHAEOLOGY, ETHNOLOGY AND ANTHROPOLOGY OF EURASIA* 4 (2001), 65-76.
- Shunkov (M. V.) and Agadjanian (A. K.), 'Paleografiya paleolita Denisovoi peshery', in *ARCHAEOLOGY, ETHNOLOGY AND ANTHROPOLOGY OF EURASIA* 2/2 (2000), 2-19.
- Turner (C. G.), 'Physical Anthropology in the U.S.S.R. Today. Part II', *QUARTERLY REVIEW OF ARCHAEOLOGY* 8/3 (1988), 4 – 6.
- _____, 'Paleolithic Teeth of the Central Siberia Altai Mountains', in *Chronostratigraphy of the Paleolithic in North, Central, East Asia and America*, Novosibirsk: Institute of History, Philology and Philosophy Sib. Br. USSR Acad. Sci. 1990, 239 – 243.
- _____, 'Paleolithic Siberian Dentition from Denisova and Okladnikov Caves, Altaiskiy Kray, USSR', *CURRENT RESEARACH ON THE PLEISTOCENE* 7 (1990), 65 – 66.
- Vattathil (S.), and Akey (J. M.), 'Small Amounts of Archaic Admixture Provide Big Insights into Human History', *CELL* 163 (2015), 281–284.
- Vernot (B.) and others, 'Excavating Neandertal and Denisovan DNA from the Genomes of Melanesian Individuals', *SCIENCE* 10/1126 (2016), 1-9.