2 DSR - Gubs Gorge Sites

2.1 Introduction

Three sites were sampled in the Gubs Gorge, Northwest Caucasus (Figure 2.1): Monasheskaya Cave, Gubs Rockshelter 1, and Barakaevskaya Cave. All the sites are on the north (south facing) side of a limestone gorge, around 100 m above the present river level (which has most likely downcut since the period of interest). Gubs Rockshelter is ~50 m west (upstream) of Monasheskaya, while Barakaevskaya is approximately half of a km further west. In total, fifteen luminescence and thirty-seven other samples were taken, on the 4-5th July 2004 (Table 2.1 and Table 2.2).

The natures and histories of the sites were assessed prior to sampling. Reviews of the sites and sediments can be found in Section 2.5 of this report, and tabulated notes from these found in Appendix 1. A general description of the samples, and tabulated information relating to each luminescence sample is presented in Appendix 2. In situ measurements of environmental gamma dose rate were made at the locations of all dating samples. A general description of the measurements, and tabulated information relating to each measurement is presented in Appendix 3.

Seven luminescence-dating samples were taken, in stainless steel tubes, from the Middle Palaeolithic archaeological layers at Monasheskaya (EFD4L001 – 007, Table 2.1, Figure 2.2, Figure 2.3, Figure 2.4), plus one modern surface sample in a plastic pot to test for zeroing of the luminescence signal at the cave mouth (EFD4L014, Figure 2.3b). All these samples included associated limestone clasts, so that mineral and/or grain-size fractions present in the limestone itself might be identified and avoided in luminescence measurements on the sediment (Table 2.1).

Five of the luminescence-dating samples at Monasheskaya were taken from profile У-Г (Figure 2.2, Figure 2.3, Figure 2.4), through Layers 3 and 4. Previous studies of this sequence has yielded palynological evidence suggesting a series of climatic fluctuations within OIS 3, in addition to apparent changes in the rates of exfoliation inferred from clast concentrations. It is believed that the upper part of this sequence may link to the lower part of the sequence at Gubs Rockshelter 1, although this remains to be tested.

Site	Section	Context	Sample		Field gamma spectrometry		Ass. Samples
			Number	Type	Measurement	Dose rate (mGy/a)	
Monasheskaya	У-Г	Layer 3A (upper)	EFD4L001	Tube ~1 kg	EFD4G004	0.14 ± 0.01	Limestone Clast
Monasheskaya	У-Г	Layer 3a (3A-5)	EFD4L002	Tube ~1 kg	EFD4G005	0.19 ± 0.01	Limestone Clast
Monasheskaya	У-Г	Layer 3A (lower)	EFD4L003	Tube ~1 kg	EFD4G006	0.26 ± 0.01	Limestone Clast
Monasheskaya	У-Г	Layer 4 (upper)	EFD4L004	Tube ~1 kg	EFD4G007	0.23 ± 0.01	Limestone Clast
Monasheskaya	У-Г	Layer 4 (lower)	EFD4L005	Tube ~1 kg	EFD4G008	0.22 ± 0.01	Limestone Clast
Monasheskaya	Д-Ф	Layer 2	EFD4L006	Tube ~1 kg	EFD4G009	0.30 ± 0.01	Limestone Clast
Monasheskaya	Д-Ф	Layer 4 (mid)	EFD4L007	Tube ~1 kg	EFD4G010	0.23 ± 0.01	Limestone Clast
Gubs RS1	Sq3, S	Layer 2 (upper)	EFD4L008	Tube ~1 kg	EFD4G011	0.17 ± 0.01	-
Gubs RS1	Sq3, S	Layer 2 (lower)	EFD4L009	Tube ~1 kg	EFD4G012	0.22 ± 0.01	-
Gubs RS1	Sq3, S	Layer 5	EFD4L010	Tube ~1 kg	EFD4G013	0.16 ± 0.01	-
Gubs RS1	Sq3, S	Layer 6	EFD4L011	Tube ~1 kg	EFD4G014	0.16 ± 0.01	-
Gubs RS1	Sq3, S	Layer 7	EFD4L012	Tube ~1 kg	EFD4G015	0.14 ± 0.01	-
Gubs RS1	Sq3, S	Layer 4	EFD4L013	Foil ~1 g	-		-
Monasheskaya	-	Modern Surface	EFD4L014	Pot ~1 kg	-		Limestone Clast
Barakaevskaya	A-V	Layer 3	EFD4L015	Bag ~1 kg	EFD4G016	0.056 ± 0.004	-

Table 2.1. Luminescence and related samples taken, and measurements made at sites in the Gubs Gorge region.

2 DSR Gubs Gorge

Site	Section	Context	Sample			Associated Sample(s)
			Number	Depth	Type	
Monasheskaya	У-Г	Layer XГ	EFD4T001	-	T/M/S	-
Monasheskaya	У-Г	Layer 3A-1	EFD4T002	-	T/M/S	-
Monasheskaya	У-Г	Layer 3A-2	EFD4T003	-	T/M/S	-
Monasheskaya	У-Г	Layer 3A-3	EFD4T004	-	T/M/S	-
Monasheskaya	У-Г	Layer 3A-4	EFD4T005	-	T/M/S	-
Monasheskaya	У-Г	Layer 3A-5 (=3a)	EFD4T006	-	T/M/S	-
Monasheskaya	У-Г	Layer 3A-1 base	EFD4T007	-	T/M/S	-
Monasheskaya	У-Г	Layer 3A-6 upper	EFD4T008	-	T/M/S	-
Monasheskaya	У-Г	Layer 3A-6 lower	EFD4T009	-	T/M/S	-
Monasheskaya	У-Г	Layer 4	EFD4T010	-	T/M/S	-
Monasheskaya	У-Г	Layer 3A-1	EFD4P011	-	Pollen	EFD4L001
Monasheskaya	У-Г	Layer 3A-5 (=3a)	EFD4P012	-	Pollen	EFD4L002
Monasheskaya	У-Г	Layer 3A-6	EFD4P013	-	Pollen	EFD4L003
Monasheskaya	У-Г	Layer 4 upper	EFD4P014	-	Pollen	EFD4L004
Monasheskaya	У-Г	Layer 4 lower	EFD4P015	-	Pollen	EFD4L005
Monasheskaya	У-Г	Layer 3A-5 (=3a)	EFD4C016	-	AMS	-
Monasheskaya	Д-Ф	Layer 2	EFD4P017	-	Pollen	EFD4L006
Monasheskaya	Д-Ф	Layer 4 (mid)	EFD4P018	-	Pollen	EFD4L007
Gubs RS1	Square 3, S	Layer 2A	EFD4T019	14-18 cm	T/M/S	-
Gubs RS1	Square 3, S	Layer 2 upper	EFD4T020	20-33 cm	T/M/S	-
Gubs RS1	Square 3, S	Layer 3	EFD4T021	33-37 cm	T/M/S	-
Gubs RS1	Square 3, S	Layer 2 mixed	EFD4T022	38-50 cm	T/M/S	-
Gubs RS1	Square 3, S	Layer 2 lower	EFD4T023	52-65 cm	T/M/S	-
Gubs RS1	Square 3, S	Layer 5	EFD4T024	70-86 cm	T/M/S	-

Gubs RS1	Square 3, S	Layer 6	EFD4T025	86-110 cm	T/M/S	-
Gubs RS1	Square 3, S	Layer 7	EFD4T026	110-130 cm	T/M/S	-
Gubs RS1	Square 3, S	Layer 4	EFD4X027	-	General	EFD4L013
Gubs RS1	Square 3, S	Layer 3 humus	EFD4C028	-	AMS	
Gubs RS1	Square 3, S	Layer 3 humus	EFD4X029	-	Soil	
Gubs RS1	Square 3, S	Layer 2 upper	EFD4P030	-	Pollen	EFD4L008
Gubs RS1	Square 3, S	Layer 2 lower	EFD4P031	-	Pollen	EFD4L009
Gubs RS1	Square 3, S	Layer 5	EFD4P032	-	Pollen	EFD4L010
Gubs RS1	Square 3, S	Layer 6	EFD4P033	-	Pollen	EFD4L011
Gubs RS1	Square 3, S	Layer 7	EFD4P034	-	Pollen	EFD4L012
Gubs RS1	Square 3, S	Layer 5 top	EFD4X035	-	General	-
Barakaevskaya	A-V	Layer 3	EFD4X036	-	General	-
Barakaevskaya	A-V	-	EFD4X037	-	General	-

Table 2.2. Tephra, Magnetic Susceptibility, Sedimentary, Radiocarbon, Pollen and General samples from the Gubs Gorge sites

Figure 2.1. (a). Sampling localities visited in the 2004 project field season. (b). Location of the sites within the Gubs Gorge. Bara. = Barakaevskaya Cave, G.R.1 = Gubs Rockshelter 1, Mon. = Monasheskaya Cave (adapted from Generalnyi Shtab 1:100,000 topographic maps, 1972 - 2000, sourced at http://www.lib.berkeley.edu/EART/x-ussr/russia.html, 08/10/2004).

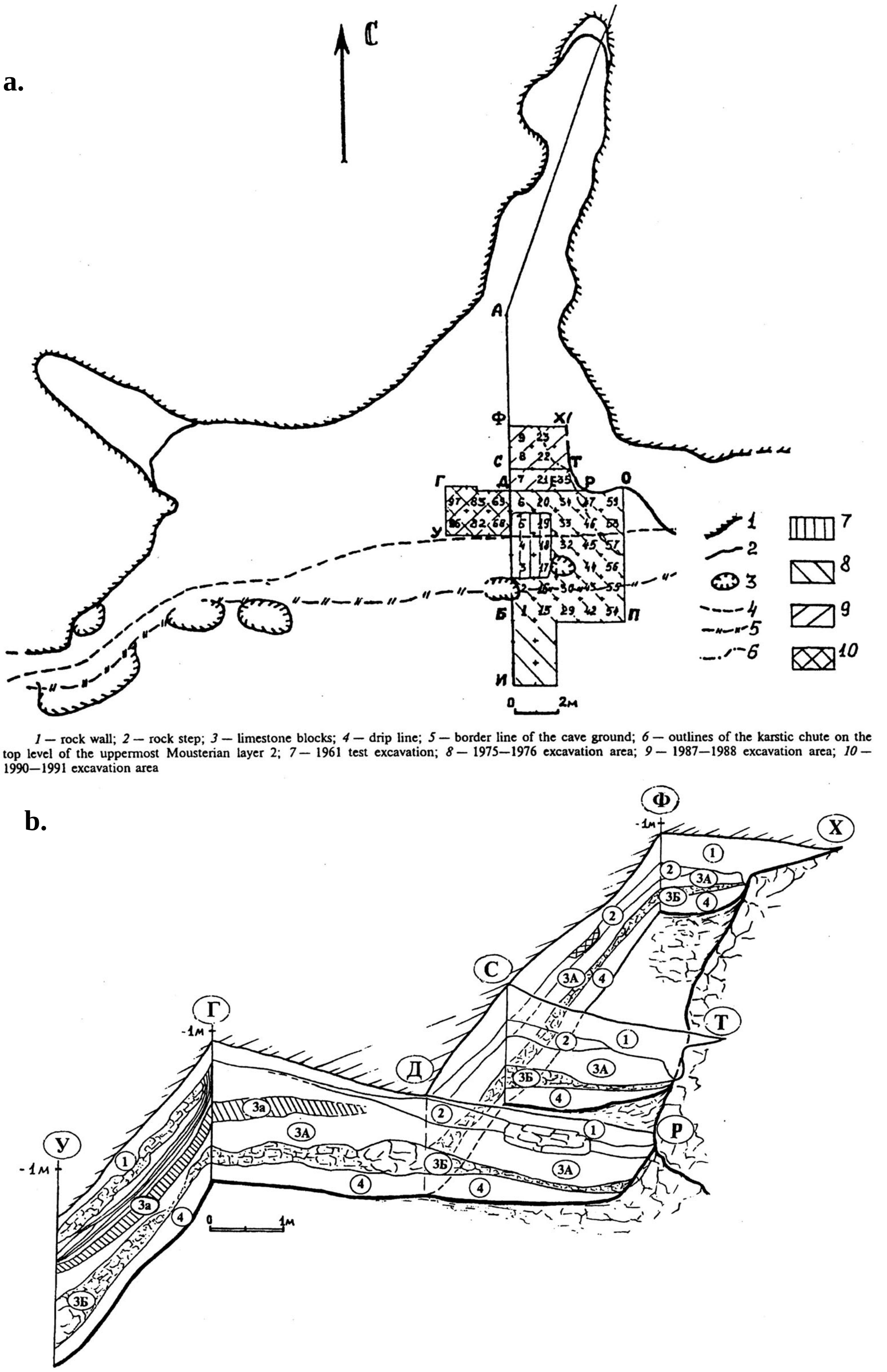


Figure 2.2. (a). Plan of Monasheskaya cave and excavated areas. (b). Illustration of various excavated sections with major stratigraphic features. Adapted from Belyaeva (1999).

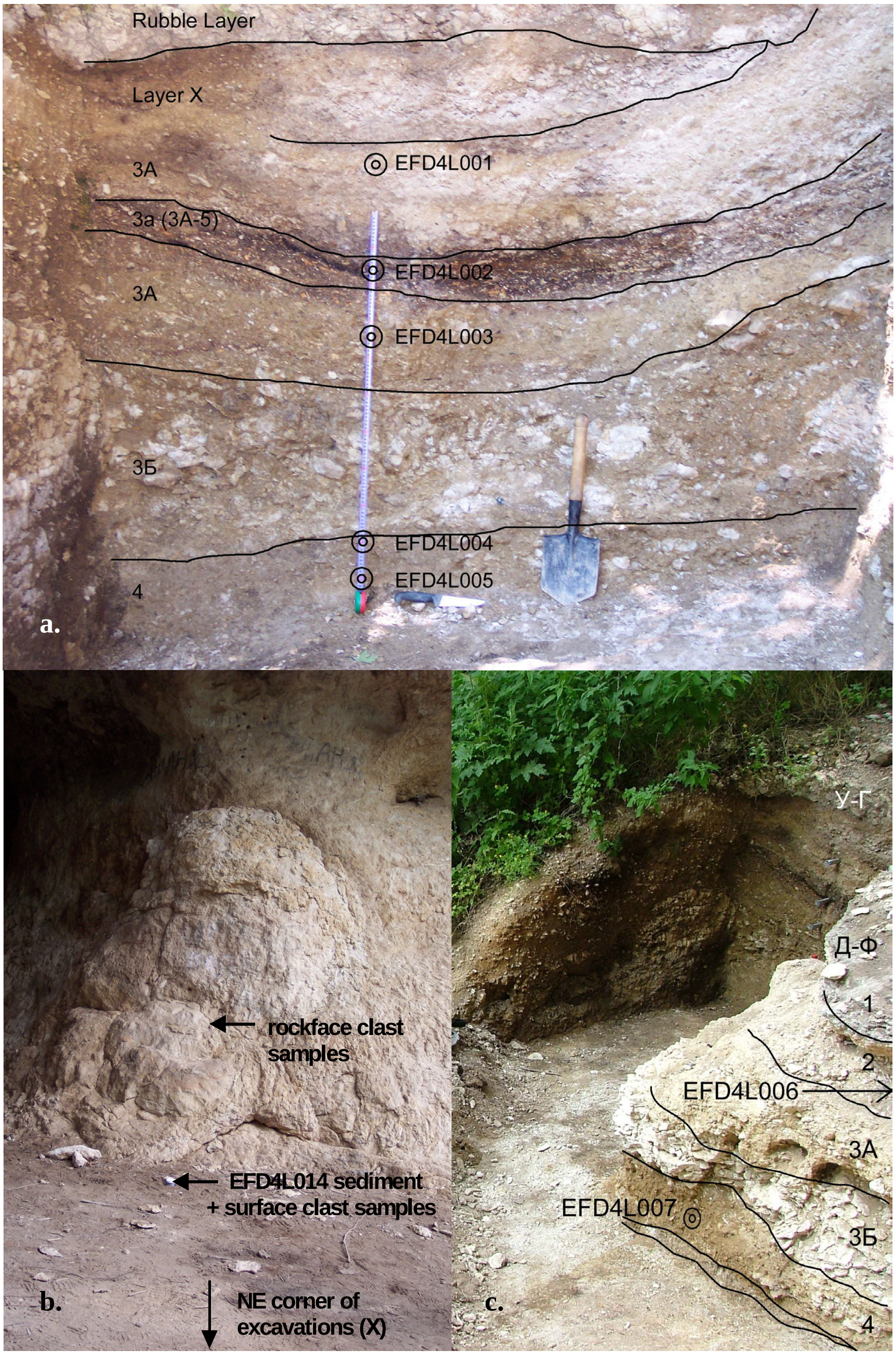


Figure 2.3. Monasheskaya Cave. (a). Section У-Г, (b). Location of modern surface sample, (c). Section Д-Ф, also showing Section У-Г. Photos b. & c. were taken from approximately the same location, but show the views in opposite directions. Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube & the field gamma spectrometer probe.

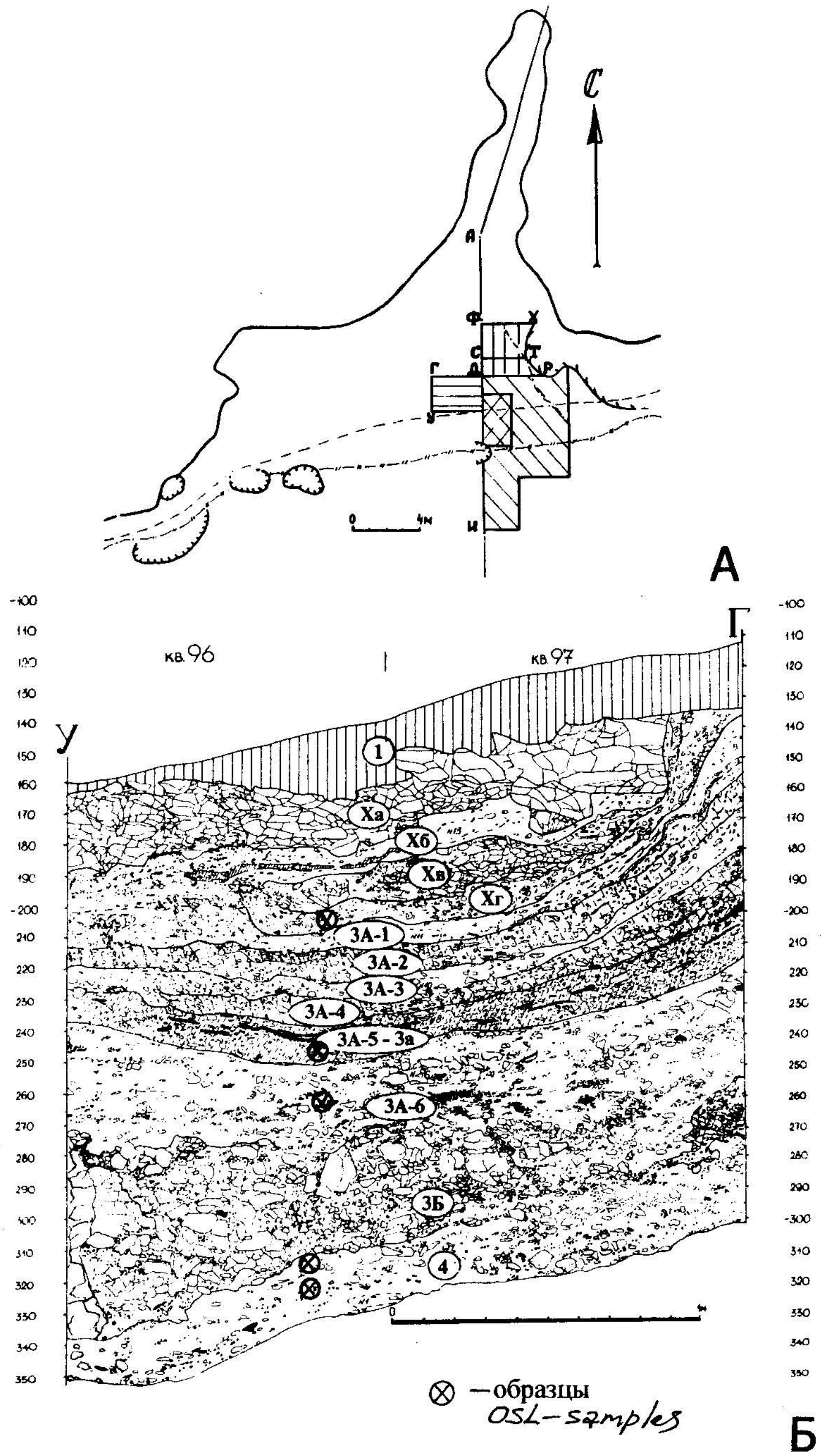


Figure 2.4. Monasheskaya Cave 2004 excavations. Plan and section У-Г including OSL sampling positions.

a.

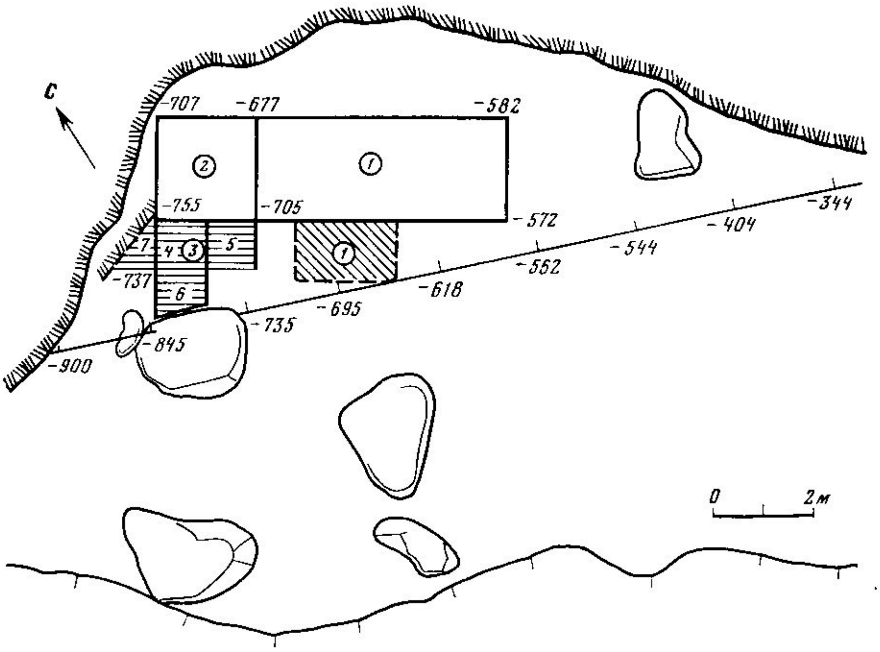
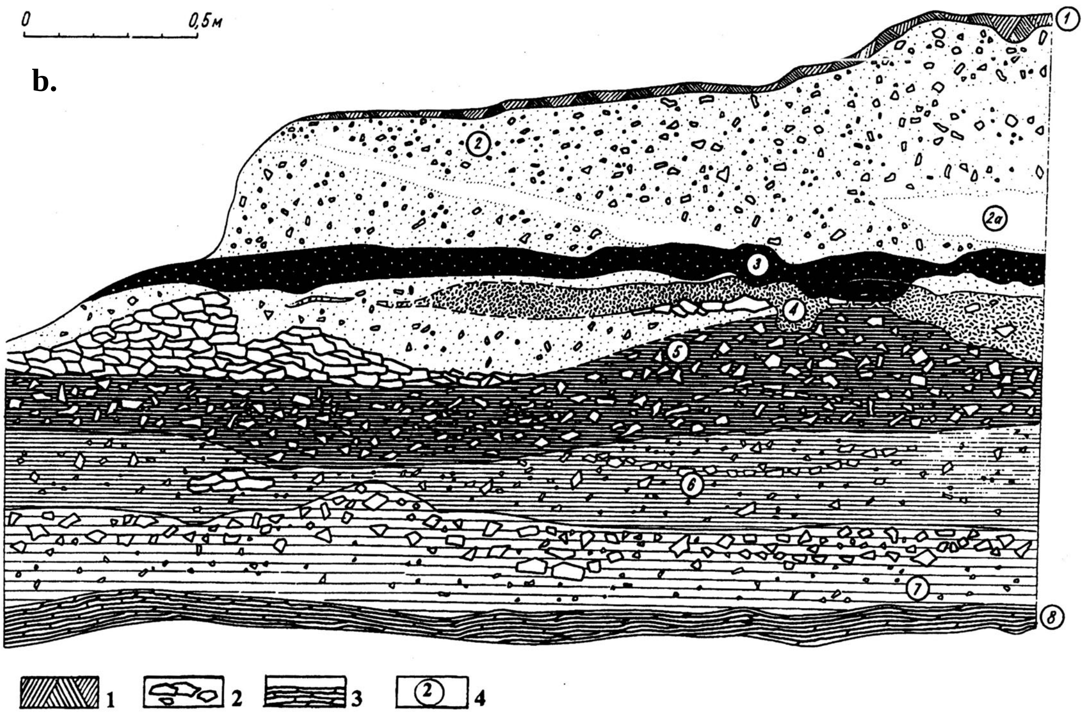


Рис. 5. Сводный план раскопок Губского навеса

1, 2 — раскоп 1962—1963 гг.: *1* (с косой штриховкой) — средневековое погребение; *3* — раскоп 1975 г.; *4—7* — квадраты раскопа

b.



1 — holocene layer; *2* — limestone rubble; *3* — limestone eluvium of the cave bedrock; *4* — numbers of the layers (after: [Любин, 1977])

Figure 2.5. (a). Plan of Gubs Rockshelter 1, after Amirkhanov (1986). 2004 section is approximately at ‘6’. (b). Gubs Rockshelter 1, after Liubin *et al*. (1973). The stratigraphy is broadly representative of the section sampled in the present study.

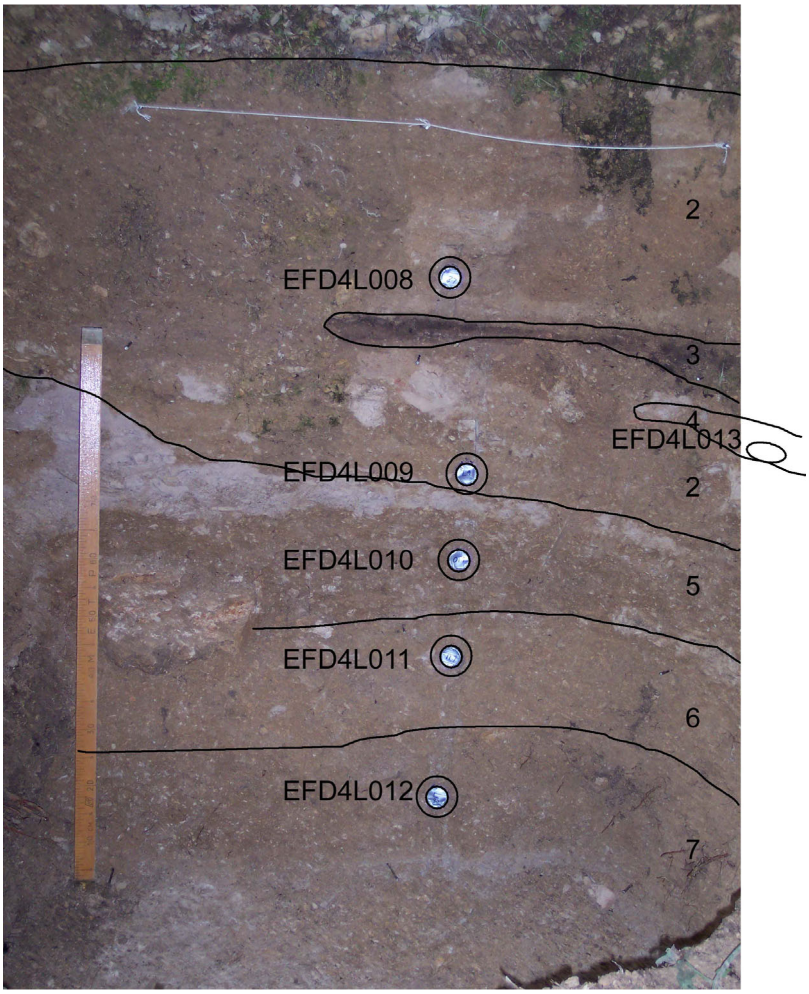


Figure 2.6. Gubs Rockshelter 1: 2004 section on the south side of Amirkhanov's excavation. The area has been labelled here square 3. Layer numbering follows Liubin *et al.* (1973) not Amirkhanov (1986). Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and the field gamma spectrometer probe.

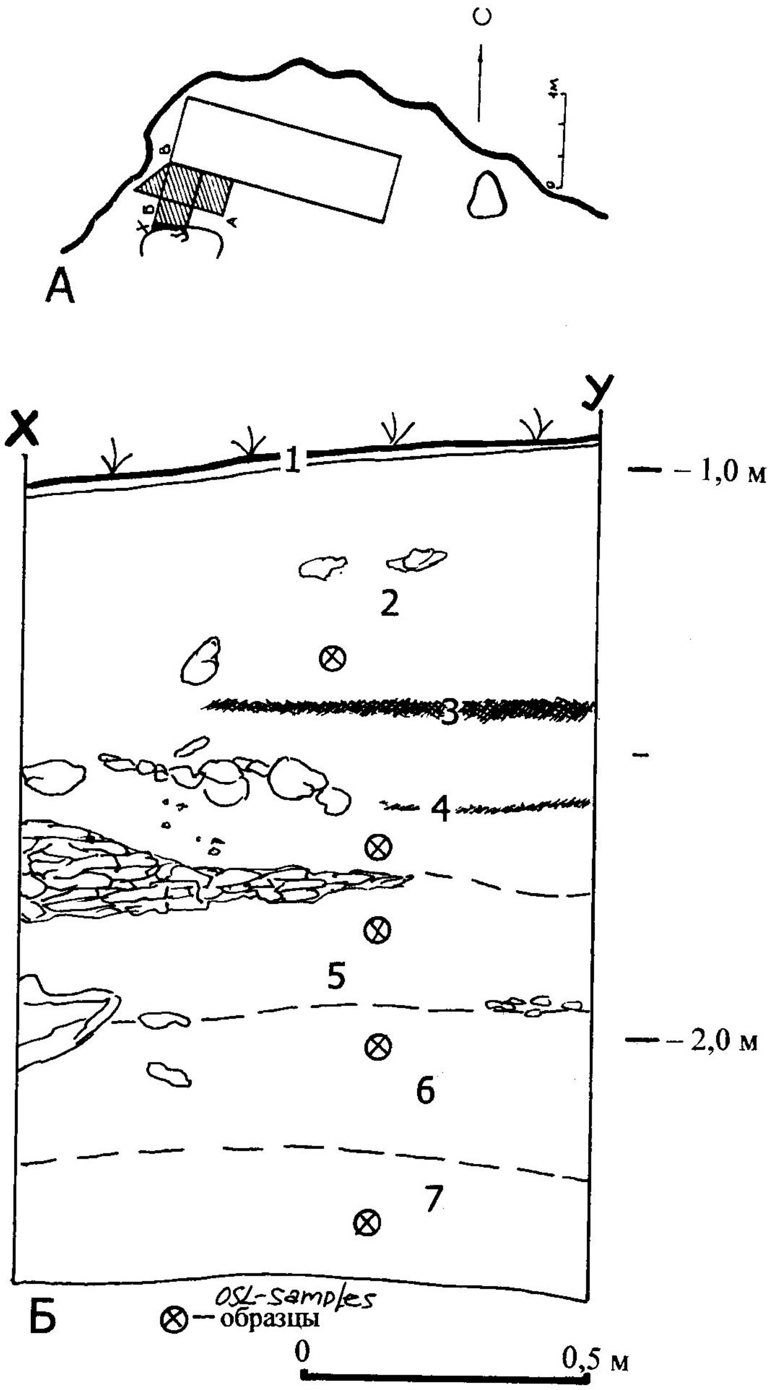


Figure 2.7. Gubs Rockshelter 1 2004: Plan and section with OSL sampling positions.

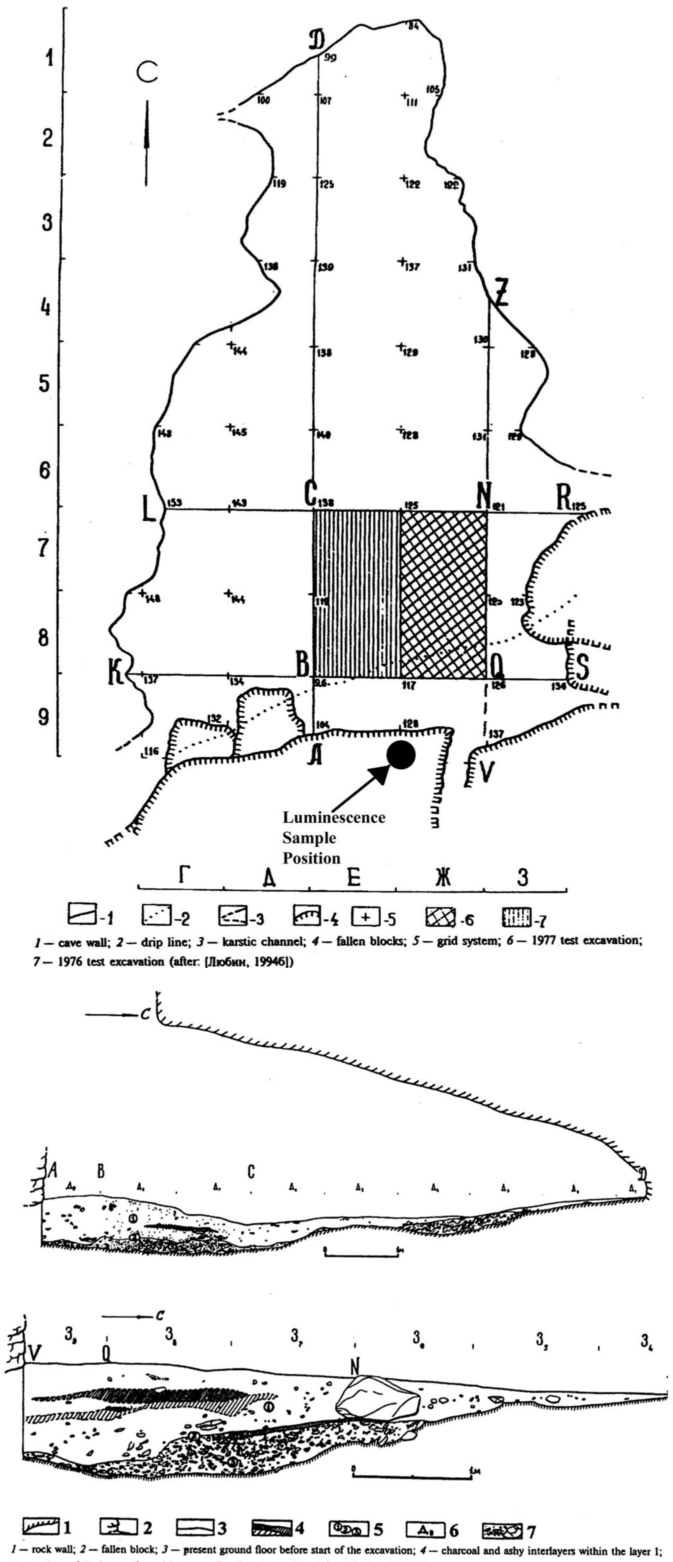


Figure 2.8. (a). Plan of Barakaevskaya cave. (b). Barakaevskaya Cave, sections A - D and V – Z. The sample was taken from the remains of Layer 3, between A and V.

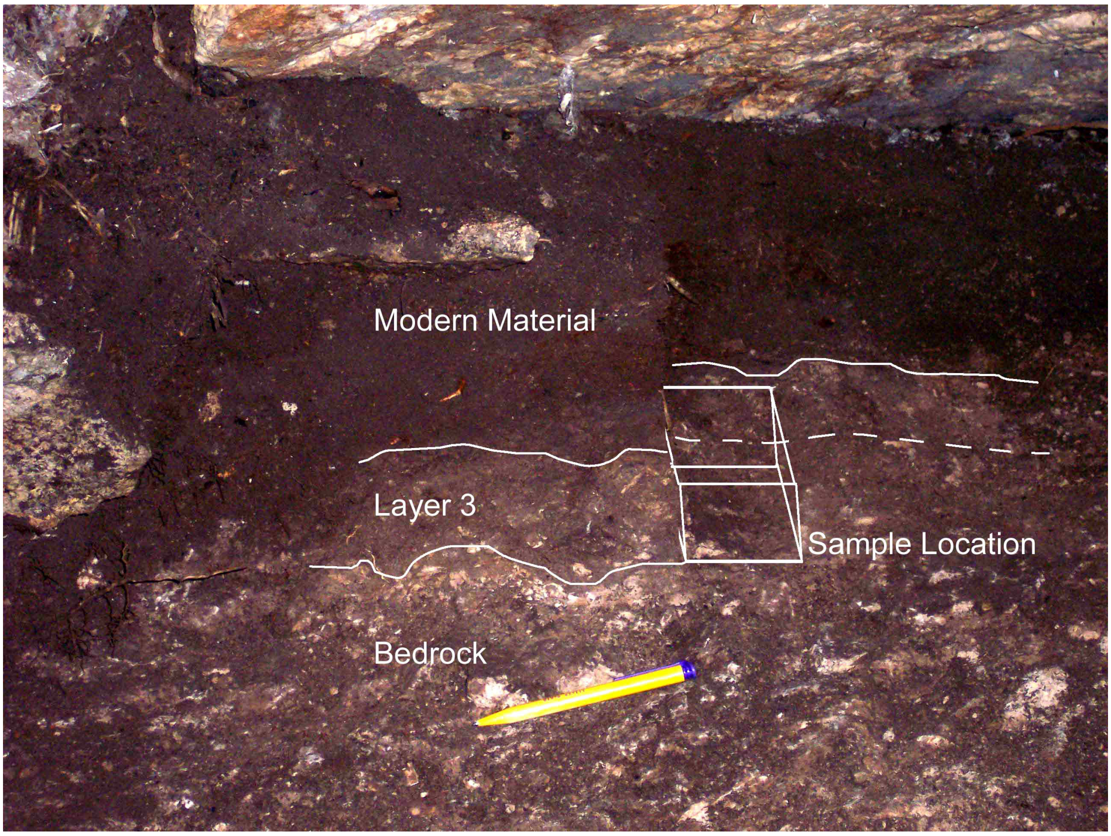


Figure 2.9. Barakaevskaya Cave, Section A-V ~Point 128, showing the remains of the prepared archaeological section located between boulder and bedrock, with covering backfill to protect the *in situ* remains. Sample location indicates the volume of sediment removed for luminescence measurement.

Two luminescence samples were taken from Layer 4 in Section У-Г at Monasheskaya, to test the duration of accumulation. However, pollen analysis of Layer 4 from Section У-Г had indicated a much warmer climate compared to Layer 4 from Section Д-Ф (Figure 2.2). Belyaeva had postulated that Layer 4 in Section Д-Ф represented the earlier part of Layer 4, and Layer 4 in Section У-Г the later part. To test this, a third sample was taken from the middle of Layer 4, in Section Д-Ф. Layer 2 was not present in Section У-Г, so a sample from this layer was taken in Section Д-Ф, approximately 1.5 m from the location of the Neanderthal skeletal remains which had been found in square 8 (Figure 2.2).

At Monasheskaya the in situ gamma dose rates at the luminescence sampling positions ranged from 0.14 mGy/a, in upper Layer 3 (EFD4G004, Table 2.1), to 0.30 mGy/a in Level 2 (EFD4G009, Table 2.1). All three measurements in Layer 4 yielded results within errors of each other (average = 0.23 mGy/a). There was sufficient signal from ^{40}K in each spectrum for automatic energy calibration in the calculation of dose rates, but the dose rate from the native limestone was not measured at this site, and the dose rates themselves were not sufficiently high to indicate major external input of material. However, the results did not appear to correspond directly to the amount of limestone clasts adjacent to each measurement position, so differences down section might indicate the presence of variable amounts of allochthonous material in the sediments.

A total of ten samples were taken for combined volcanic tephra, magnetic susceptibility and sedimentary analysis (see T/M/S samples in table 1.1.2). These were taken from a single newly prepared continuous vertical cleaned profile at Monasheskaya before being transported to Cambridge University in September 2004 for investigation by David Pyle and Nick McCave. A small number of general-purpose samples (designated with the EFD4X prefix in table 1.1.2) were taken for specific geochemical reasons, for soil thin section analysis, or to characterise particular materials or sedimentary contexts.

Pollen samples were taken at all points where full luminescence dating samples were removed, the purpose being to permit the optically stimulated luminescence measurements to be firmly tied in with existing palynological data by means of the correlation of pollen compositions. Altogether 7 pollen samples came from two sections at Monasheskaya, with the sediment being removed from the immediate surroundings of the steel tubes, i.e. in the vicinity of where the gamma dosimetry readings had been made. Additionally, a single AMS 14C charcoal sample was taken from layer 3A-5 (=3a) at Monasheskaya.

Three luminescence-dating samples were taken from Middle Palaeolithic archaeological layers at Gubs Rockshelter 1 (one each from Layers 5, 6, and 7, EFD4L010 – 012, Figure 2.6, Figure 2.7). Dates from these samples will provide broad chronological definition of the Middle Palaeolithic at the site, and test the posited pollen-stratigraphic correlations with Monasheskaya. Two luminescence samples were taken from Upper Palaeolithic Layer 2 (EFD4L008 - 009), plus one small spot sample of apparently burnt clayey material from Layer 4 (EFD4L013). The samples from Layer 2 would provide a terminus ante quem for the Middle Palaeolithic at Gubs Rockshelter 1 and, by extension, Monasheskaya.

In situ gamma dose rates at the luminescence sampling positions in Gubs Rockshelter 1 ranged between 0.14 mGy/a, from Layer 7 (EFD4G015, Table 2.1), and 0.22 mGy/a from the lower part of Layer 2 (EFD4G012, Table 2.1). The other three positions yielded gamma dose rates of 0.16 and 0.17 mGy/a. At Gubs Rockshelter 1 there is rather more consistency in the gamma dosimetry between sampling locations than at Monasheskaya, which may reflect the less stony nature of the Gubs deposits. However, the readings are also, on average, lower and although sufficient ^{40}K levels were recorded to conduct automatic energy calibration, this may indicate an absence of allochthonous input.

In all eight samples were taken for combined volcanic tephra, magnetic susceptibility and sedimentary analysis (Table 1.1.2). These were taken from a single newly prepared continuous vertical cleaned profile at the Gubs rockshelter 1 before being transported to Cambridge University in September 2004 for investigation by David Pyle and Nick McCave. A small number of general-purpose samples (designated with the EFD4X prefix in table 1.1.2) were taken for specific geochemical reasons, for soil thin section analysis, or to characterise particular materials or sedimentary contexts.

At Gubs five pollen samples were taken adjacent to where luminescence dating samples were removed, the purpose being to permit the optically stimulated luminescence measurements to be firmly tied in with existing palynological data by means of the correlation of pollen compositions. As at Monasheskaya, the sediment came from the immediate surroundings of the steel tubes, i.e. in the vicinity of where the gamma dosimetry readings had been made. A single AMS ^{14}C charcoal sample was taken from the humus rich layer 3 at Gubs, although on later inspection the quality of the material was not deemed very promising of a successful age determination.

In 2004 examination of Barakaevskaya revealed that most of the sediments in the cave itself had been removed in the earlier excavations, and that only a thin “specimen” section underlying the limestone blocks at the entrance had been left beneath a covering of back fill. The Middle Palaeolithic layer still in situ was only ~6 cm thick at this point (Figure 2.8b, Figure 2.9) with the rest of the overlying material representing earlier excavation spoil. This was removed, and after brief cleaning of the surface with a trowel, a single bulk luminescence sample was quickly trowelled into a black bag, which was sealed, labelled, and black bagged again (EFD4L015, Figure 2.9).

A gamma spectrometry measurement was made at the point from which the luminescence sample was taken (EFD4G016, Table 2.1). The measurement position was surrounded on all sides, but mainly by the limestone of the cave walls, floor, and the blocks above. The observed dose rate was therefore not representative of that in the sediment sample, and dosimetry will need to be based on a combination of the values obtained from field measurement EFD4G016, and those from laboratory measurements on the sample material EFD4L015.

2.2 Luminescence samples

Luminescence dating samples were generally taken in stainless steel tubes (l = 15 cm, ∅ = 3 cm) (Appendix 2.2). The ends of these tubes were taped to retain the sample material and water following very brief light exposure. The tubes were then labelled and sealed in labelled zip-lock bags, with additional loose sediment for gamma spectrometry measurements in the laboratory. This sediment was collected from a 6 cm ∅ hole made around the sampling position using a larger steel "over tube". The resultant hole facilitated placement of a 2" NaI probe for field gamma dose rate measurements (Section 2.3). The zip-lock bags were packed in groups of two or three in labelled and sealed black bags. Other samples are described individually in the text, but were all ultimately packed in labelled and sealed black bags before being packed in a larger black bag containing all samples from the site and/or region.

2.3 Gamma Dosimetry

In situ determinations of gamma dose rate were made by field gamma spectrometry at the point of sampling for all "full" luminescence dating samples (taken using the steel tubes). The measurements were conducted using a Rainbow multichannel analyser with a 2" x 2" NaI probe. Gamma emissions were measured in the approximate range 10 – 3072 keV in 1024 channels, such that all emissions from ^{40}K, and the U and Th decay series could be observed. These account for the vast majority of gamma radiation present in a "natural" environment. In situ "infinite medium" gamma dose rates were calculated from counts integrated above energies of 450 keV, above 1350 keV, and from the empirically corrected total energy integral. The proportion of total counts above 450 keV, and above 1350 keV, will be similar for ^{40}K, and the U and Th decay series when they are in secular equilibrium. Thus, in a mixed field conversion from counts to dose rate can be made directly by integrating above these energies, with little effect from variations in the relative concentrations of ^{40}K, and the U and Th decay series. In the present study conversion was made using factors measured for another but similar instrument, which have been adopted as standard in the SUERC laboratory for 2" x 2" detector dimensions.

The field gamma spectrometry measurements were made for 10 minutes (600 s) each, which yielded counts >450 keV of between 4174 (EFD4G016, Barakaevskaya) and 9071 (EFD4G009, Monasheskaya, Layer 2). In situ gamma dose rates were calculated by hand following field measurements, using integrated counts above Channel 150, and assuming that the instrument gain setting was correct: i.e. It had not varied since the instrument was last set such that the ^{40}K peak (1461 keV) was at Channel 487, and channel width was thus ~3 keV. Recorded spectra were later processed using proprietary software ("Rainbow 3"), which included energy recalibration to the location of the gamma emission from ^{40}K observed in each spectrum.

For measurement, the NaI probe was generally placed in a 6 cm diameter hole cut around each sampling point using a larger "overtube". It was not generally possible to drive the tube into the sections the "ideal" distance of 30 cm, which would ensure that no more than ~1% of the detected gamma field would come from outside the sampled section. However, hole depth and the approximate geometry of the sediments around the measurement points was assessed and recorded. With specific exceptions (EFD4G016, Barakaevskaya), it was ensured that hole depth was sufficient for the large majority (>~90%) of the detected gamma field to come from sediments in the immediate vicinity of the luminescence sampling point. The relatively enclosed nature of the sections being sampled ensured that the remainder of the field would be close to an average for the section, such that averaging effects of no more than ~3% might be expected. Since this is less than other expected sources of uncertainty, no attempt was made to correct for it. Other sources of uncertainty in the dose rates include: the accuracy of the dose rate conversion factors, instrument reproducibility (over and above counting statistics), variations in water content during burial, and U-

Series disequilibrium effects. The instrument related factors are currently being assessed, and the sample-related factors will be assessed during later work on the samples in the laboratory. The dose rates quoted in this report should thus be regarded as preliminary, but are likely to be correct within uncertainties of ~5%.

2.4 Tephra, Magnetic Susceptibility, Sedimentary, Radiocarbon and Pollen Samples

2.4.1 Tephra, Magnetic Susceptibility and Sedimentary Samples

The samples taken for tephra, magnetic susceptibility and sedimentary analysis consisted of loose sediment scraped with a knife from a cleaned prepared vertical section and placed into labelled zip-locked polythene bags. Sampling was contiguous and normally covered 5 cm of sedimentary accumulation although this had to be adjusted on occasion to take account of layer boundaries in order to avoid mixing material from separate units. During sampling the larger clasts were generally excluded in favour of fine-grained sediment, since the latter was deemed more suitable for the intended analyses.

2.4.2 Radiocarbon Samples

Sampling for radiocarbon was constrained by the paucity of appropriate material that is suitable for measurement by AMS. Normally only where cultural material was prevalent in a layer was it feasible to locate good radiocarbon samples. In the Gubs Gorge the only material found in situ from clear stratigraphic horizons that were considered worth retaining for age determination was charcoal. The concentration on using previously excavated sections rather than digging new areas precluded the recovery of bigger more representative groups of 14C samples. It proved necessary to separate the charcoal from the enclosing sediment by laboratory wet sieving. However, beyond this no treatment was applied to the 14C samples.

2.4.3 Pollen Samples

Within this project sampling for pollen was, in general, limited since most of the sites had already been palynologically studied and it was felt that there was little need, or resource, to duplicate the earlier findings. However, because the sections we were sampling were commonly not those that had been palynologically studied, it was deemed advantageous to take new samples in order to permit correlation of the OSL determinations with the proxy environmental and climate pollen data. With this in mind individual labelled zip-locked polythene bags of sediment were recovered from around the locations where the OSL steel tube samples were sited.

2.5 Pre sampling Site Reviews (by Allsworth-Jones)

2.5.1 Monasheskaya

This summary is based on E.V. Belyaeva's book "The Mousterian World of the Gubs River Canyon" (1999) which in turn is based on her thesis (1995). Following the earlier work by Liubin and Autlev (1961-1964, 1975-1976), she has directed work at the cave since 1987.

The Gubs canyon is about 4-5 km long and 150-200 metres deep, cut into Jurassic limestone. This cave occupies an area of 390 square metres. The plan (Figure 2.10) indicates the position of the excavations in the broad frontal part of the cave. There are two 'cave corridors' which lead back from it. The summary which follows concentrates on the stratigraphy, fauna, and flora, details of which are given in chapters 3 and 4 of Belyaeva's book. The Figures are all taken from the book.

2.5.1.1 Excavations and stratigraphy

Initial stage (1961-1964)

Cave discovered by P.U. Autlev in 1961. A test pit on the southern edge of the platform in front of the cave along its long axis (5.6 square metres) (Figure 2.10: 7 vertical hatch). 3 layers distinguished.

(1) Humus, with mixed archaeological material (flints, Meotian and Mediaeval pottery). 25-30 cm.
(2) Loose sandy loam, also with mixed material and humus lenses. 70 cm.
(3) Compact loam with rubble, directly on bedrock. 50 cm.

In 1964 the cave was visited by a group of archaeologists and geologists. V.M. Muratov cleaned the north wall of the test pit, and described the following more complicated section up to 2 metres thick (Figure 2.11).

(1) Humified brown sandy loam with gravel and sharp edged limestone rubble (30-40%). Average rubble size 0.3-0.5 cm. Clear boundary to layer beneath. Up to 70 cm.

(2) Pale greyish sandy loam filled with gravel and limestone rubble (15-20%). Average rubble size 2-5 cm. Up to 35 cm.

(2A) Same, but with browner matrix. 18-35 cm.

(3) Analogous to (2A) but matrix more sandy, pale brown. Contains sub-horizontal lenses of colluvial rubble, as well as stones with no particular orientation. In the top and mid part, many Holocene burrows (krotovinas) with matrix similar to layer 1. Clear contact. Up to 40 cm.

(4) Yellowish brown gravely and clayey sand with rubble (as in layer 3). Individual blocks up to 15 cm in size. Thin rock fall horizons in the upper and mid parts. Matrix up to 50-60%. Clear contact. 40-45 cm.

(5) Greyish-green limestone eluvium (slabs of rubble) with sandy clayey matrix (not more than 15%). 10-15 cm.

The archaeological material from here and from Gubs rockshelter was studied by Liubin, and on this basis he created the Gubs Mousterian culture.

<u>First series of excavations (1975-1976)</u>

31 square metres, most in 1976. N, E, and S of the initial test pit (Figure 2.10: 8 diagonal hatch). Grid network set up. 2 new sections. Transverse D-E (= 6-20) north of Muratov's section (Figure 2.12). Longitudinal B-D (= 3-6) western side down the slope (Figure 2.13). Sequence in agreement with Muratov, but some additional observations.

The difference between layers 2 and 2A in terms of the colour of the matrix is due to the amount of cultural material included in the latter (ash lenses, small bits of charcoal, bone fragments, some decayed) which produces a darker colour, sometimes ash-lilac, and sometimes in the form of lenses.

Layer 3 had fewer archaeological finds, but (as in the layer above) there were many burrows (krotovinas).

Layer 4 was sharply differentiated from layer 3 by a rock fall horizon 10-15 cm thick.

The longitudinal section to the south showed little differentiation between the layers (Figure 2.13, left hand side). Instead there is a transition to a practically homogeneous slope colluvium (dark brown loam with rubble). The large stones in the upper part of the deposits at this point indicate roof collapse.

In 1975 it became clear that a large part of the upper Pleistocene deposits had been destroyed by later inhabitants at the site. Within the cave, traces of a travertine floor can be observed on the walls at a height of 2-2.5 metres above the present ground surface. Within these remnants were found a few Upper Palaeolithic artefacts, some charcoal, bones, and shells of Helix. Liubin estimated that up to two thirds of the Pleistocene deposits formerly present in the cave may have been removed in this way.

In 1976 there was another surprise, when it became clear that the Mousterian occupation at the base on the east was blocked off by the steep slope of a rock channel (Figure 2.10: 6 and Figure 2.11: 4, the upper edge of this feature, which is referred to as a ‘karstic chute’, appears at about the height of layer 2).

Renewed excavations (1987-1988)

7 square metres excavated north of the previous trench (Figure 2.10: 9 diagonal hatch). Two new transverse sections. Figure 2.14, C-T (= 7-35) and Figure 2.15, (= 9-23). One longitudinal section on the west side. Figure 2.16, D-F (= 7-9). The area actually occupied by the layers was curtailed by the edge of the channel (shown in the block diagram at Figure 2.12). The diagram also shows the tendency of the layers to slope down, both E-W (away from the edge of the channel) and N-S (towards the outside of the cave). The succession of layers was in essence the same as before, but some distinctions were made (shown clearly by the numbering of the layers in the four Figures referred to).

Layer 2 could not be reliably subdivided, therefore 2A is not indicated. But layer 3 was divided into two. (3A) the main part of the layer as such. (3B) a sterile rock fall horizon. No change in layer 4. Layer 5 absent. In this part, layer 2 was much destroyed by Holocene pits and krotovinas, as well as a Mediaeval child's grave (Figure 2.16: 2). Nonetheless, this layer produced an abundance of archaeological and faunal material, as well as human remains (Belyaeva, Levkovskaya, Kharitonov, RA, 1992: 3). They are poorly preserved but include 2 phalanges, fragments of vertebrae, ribs, and a mandible?, as well as 2 complete and 11 fragmentary teeth. They have been classified as Neanderthal.

Renewed excavations (1990-1991)

6 square metres excavated west of the long axis dividing the cave (Figure 2.10: 10 cross hatch). Transverse section G-D (= 97-69) (Figure 2.17, north face). Longitudinal section U-G (= 96-97) (Figure 2.18, west face). The position of the two sections is also shown in the block diagram (Figure 2.12). The layer succession is basically the same as before, but the longitudinal section U-G does show some idiosyncratic features. The centre of the excavated area was disturbed by a large Holocene pit, which is shown only on the cave plans (Figs. 20-30).

Layer 2 was hardly present in this area. Immediately underlying Holocene layer 1 in the western section, it is replaced by a series of deposits which do not have an analogy elsewhere (Figure 2.18: X a-g). These deposits look as though they filled a depression of some sort, and their division into 4 units was suggested by the geologist N.E. Polyakova. Xa consists largely of broken blocks (85-90%) of different sizes. X**b** is a yellow-brown sandy loam (30-40% rubble) of variable thickness. XB is a loose light-coloured sandy loam, filled with rubble (up to 75%). Xg is rather like the underlying 3A-1, but darker. Polyakova's suggestion is that moist conditions, even the presence of stagnant water, might be indicated at this point.

Layer 3A is broadly analogous to the layer of the same name elsewhere, but again at Polyakova's suggestion it has been sub-divided into 6 separate units. 3A-1, 3, and 6 are more or less 'typical' for 3A in general, consisting of yellowish grey-green compact sandy loam, more or less packed with gravel and rubble. 3A-6 has lenses within it which may indicate anthropogenic or possibly soil formation processes. 3A-2 and 4 have more gravel and rubble (up to 70-80%) which makes them looser and gives them a whitish colour. 3A-5 equals what is here termed 3a, the main cultural horizon, dark in colour, with the maximum density of finds. Its maximum thickness is 20-25 cm. The finds include flint tools, with a high proportion of notches and denticulates, fragments of bone, including some which are burnt, and lenses with very small fragments of decomposed or burnt bone.

Layer 3b is sub-divided into a number of units, some with enormous blocks. Layer 4 is as before, the archaeological finds within it continuing right down to bedrock.

2.5.1.2 Summary

The stratigraphic position is summarised by Belyaeva, who makes the following points.

1. Layers 3 and 4 exist only within the bounds of the rock channel, defined as having a trough-like configuration, with steep sides and a slightly convex base. Layer 2 probably did originally extend beyond it.

2. Except for the upper part of the U-G section and in regard to horizon 3a, the overall stratigraphy does not differ substantially from that established by Muratov in 1964. In Belyaeva's excavations, layers 2A and 5 were not recognised, but 3 was divided into 3A and B. Basically, there are three Mousterian layers: 2, 3 (A and B), and 4. The total thickness of the deposits varies from 70 cm (inside) to 1.70 metres (outside). Layers 2 and 4 vary in thickness from 20 to 35 cm. 3A is 20-80 cm, 3B is 15-40/60 cm thick, the latter due to differing degrees of roof fall.

3. The characteristics of the numbered layers are as follows.

- (1) Humified sandy loam, with mixed archaeological material.
- (2) Pale grey/brownish sandy loam, a lilac tinge in places, filled with fine sharp edged rubble, plus fragments of bone, which sometimes give it a loose texture.
- (3A) Pale yellowish grey/green more compact sandy loam, less rubble than in

2, but more medium and large pieces. Mostly sharp edged, but more corroded than in 2, sometimes with a yellowish patina.

(3B) Limestone rubble of all sizes, mainly sharp edged, but the large blocks are weathered. A cold phase is indicated.

(4) Yellowish brown clayey loam with sand and gravel. Less rubble than in 3A, but more rounded and weathered, with manganese stains and some small stalactite fragments.

4. There are no clear signs of erosion, except possibly in the upper part of the U-G section. This is indicated, among other things, by the presence of many krotovinas, which are of both Holocene and Pleistocene origin. The archaeological material is in situ. In Liubin's opinion, Muratov's section indicates a basically dry climate. He thought that layer 2 was possibly an exception in this respect, but Belyaeva doubts that.

5. There is a difference of opinion over the interpretation to be given to the upper part of the U-G section. In Polyakova's view, this may be an erosional hollow. If so, the only source of the water could have been the karst corridor-cave on the west (Figure 2.10). But since there are no signs of the continuation of this feature, Belyaeva doubts this. She prefers to regard the 'saucer-shaped' depression as possibly artificial, the result of dwelling construction.

The plans showing the distribution of the finds indicate that the main concentration was on the west, in the area excavated by Belyaeva in 1990-1991, especially in layer 3a. In layer 3A-1 however there were clear traces of three hearths along the eastern side of the rock channel in the area excavated in 1987-1988.

2.5.1.3 Fauna

There are a large number of bones, but they have not produced much information because of their condition, broken up and poorly preserved. They are not heavily fossilised, which, it is suggested, may in part be due to the existence of so many krotovinas. That may have increased the acidity of the soil. One consequence of this is that the bones have little collagen, which led to the failure of C14 dating attempts in Moscow and St Petersburg. According to an e-mail message, they were 'impossibly young dates', 5-15 kyr BP. The bones from 1961 were determined by N.K. Vereshchagin and I.G. Pidoplichko, those from subsequent years by G.F. Baryshnikov and A.V. Panteleev.

The large mammals include predominant Bison (3A), Equus (2), Cervus elaphus (2 and 3A), Capreolus capreolus (3A), Capra caucasica (2 and 4), and Megaloceros (4). The rodents (unlike the large mammals) produced enough remains for a meaningful analysis, and the results are presented in the attached Table. All together there were 788 bones, 603 from the Pleistocene layers. There are three stratigraphic groups. Group 1: layers 4 and 3B. Group 2: layers 3A (horizons 1-3) and 2. Group 3: layer 1 and the Holocene krotovinas. A comparison of the rodents present (or present in large numbers) in these groups reveals significant climatic changes over time.

Group 1. A cold environment, indicated by the presence of Microtus arvicola, Citellus musicus, Cricetus cricetus, Cricetulus migratorius, and the absence of Apodemus. Group 2. An open steppe environment, indicated by the presence of Ochotona pusilla, Spalax microphtalmus, Spermophilus, Chionomys nivalis, and the sparsity of wooded forms, although there were always some woods in the vicinity. Group 3. Clear dominance of woodland forms, particularly Apodemus spp. There were specimens of Arvicola terrestris in all groups, indicating the presence of water sources nearby including the floodplain of the river Gubs.

70 bird bones were identified, belonging to the following species, according to habitat. Woodland. Erithacus rubecula, Certhia familiaris, Coccothraustes coccothraustes, Loxia curvirostra, Pyrrhula pyrrhula. Meadow-steppe. Alauda arvensis. Cliffs. Apus apus, Columba livia, Delichon urbica.

2.5.1.4 Pollen and Spores

Determinations by G.M. Levkovskaya. In 1990-1991 13 samples were obtained from section U-G (of which 11 have been reported) and 2 samples from section D-F. These results have to be evaluated in the light of further samples obtained in 1987-1988, firstly from layer 2 in section C-T, at the point where the Neanderthal remains were found (Belyaeva, Levkovskaya, Kharitonov, 1992, RA: 3), and secondly from layer 4, when material was collected during the course of the excavations at that time. The cave is now situated in a deciduous wooded zone, but it is clear that in the past the picture was different.

Layer 4

Sample **1**. Lower part of the layer. AP 28%, NAP 70%, spores 2%. AP mainly alder, oak, willow, plus Alnaster. NAP mainly emergent or water plants. Dominant Sagittaria. Many Nymphaea, Carex, Liliaceae. A few Plantago. Spores. Lycopodium clavatum, this now is characteristic of the upper wooded or sub-Alpine zone in the Caucasus. Overall, the climate was colder than at present, but the cave was in a wooded area, indicated clearly by the presence of alder. There were damp meadows in the vicinity. Alnaster is currently not found in the Caucasus, its nearest place of occurrence being in the sub-Alpine Carpathian mountains. It is considered that its pollen grains will have been blown in by the wind from higher up the slope, and that it cannot determine the overall characterisation given for the site at this time.

Sample **2**. Upper part of the layer. AP 28%, NAP 51%, spores 21%. AP mainly alder and birch, plus pine and hornbeam. NAP characterised as a mesophilous varied herbaceous assemblage. Juncus, Sanguisorba, Veronica, Pyrola, Geum, Cichorium, Carex, Liliaceae, Labiatae, Chenopodiaceae. Spores. Equisetum and Botrychium. A colder damp climate is indicated, corresponding to the lower part of the sub-Alpine belt.

There is some apparent contradiction between these results and those earlier obtained for the same layer in 1987-1988. Three samples from square 7 were analysed at that time.

(1) 5-8 cm from bedrock. AP slightly more than NAP. Alder, Betula cf. verricosa, Larix. NAP. Chenopodiaceae, Asteraceae, Caryophyllaceae, Lutraceae.

(2) 10 cm higher. AP dominant. Hazel, hornbeam, lime, alder, pine. NAP.

Asteraceae. Spores. Botrychium. In general, an improvement in the climate, indicating the presence of deciduous woodland.

(3) Upper part of layer 4. AP still dominant. Hazel, hornbeam, oak, birch, Ostrya, Alnaster. There is an indication of a worsening climate.

All together, Levkovskaya considered that the three samples revealed interstadial conditions, the climatically most favourable being sample 2. The picture obtained in 1990-1991 is distinctly colder than that. The paradox is resolved by Belyaeva when she postulates that the samples from square 7 represent the earlier part of layer 4, whereas the samples from the U-G section represent the later part. It is clear that the overlying layer 3B is significantly colder, and the U-G samples would be approaching it. The sampled areas are in different parts of the cave, and some displacement of the deposits also cannot be excluded. It is on this basis that in her general summary Belyaeva claims that human occupation at the site began in the first of three climatically more favourable phases.

Layer 3B

Sample **3**. Rockfall horizon. AP 14% NAP 86%. AP alder, birch, Ostrya, Alnaster. NAP characterised as mesophilous varied herbaceous assemblage. Carex, Portulaca, Liliaceae, Leguminosae, Ericaceae, Chenopodiaceae, Gramineae, Cyperaceae. Climate very cold and damp, cave near the boundary of the sub-Alpine and Alpine zones. Trees and bushes in some places.

Layer 3A and 3a

Sample **4**. Base of 3A. Suddenness of climatic change suggests that there is a break in sedimentation between this layer and 3B, or perhaps some erosion. AP shows pronounced dominance of deciduous trees including Juglans regia, a species which is exotic to the area. An optimum warming is in evidence. AP 63%, NAP 33%, spores 4%. AP includes 68% deciduous species. Juglans regia 26%, elm 24%, alder 22%. Plus Pterocarya 6% (this is a Kolchid element) and hornbeam, lime, ash, birch, hazel, oleaster, oak. Xerophytes (also exotic to the area) Pistacia and Celtis. NAP dominant Umbelliferae, plus Pedicularis, Plantago, Carex, Myriophyllum, Orhidaceae, and

Liliaceae. Spores. Filicales, some Lycopodium. In general, the lower part of the wooded zone is indicated, damper than at present.

Sample **5**. 3A. A decline from the optimum. Dominated by NAP, indicating open country, but much is indeterminable. AP similar to preceding sample, but the deciduous proportion now is 53%. Dominant Juglans regia, plus alder, elm, birch, willow, hornbeam, oak, Cornus. No Pterocarya, Pistacia, or Celtis. NAP dominant varied herbaceous assemblage, including Carex, Thalictrum, Pedicularis, Artemisia, Chenopodiaceae. Spores, a little Lycopodium. This is a wooded steppe.

Sample **6**. 3A. Final phase of warm episode. In general, similar to preceding. AP, deciduous proportion now 33%. Juglans regia 17%, plus alder, elm, birch, oak. A little Pistacia and Alnaster. NAP more or less as before, again much indeterminate. Carex, Liliaceae, Umbelliferae, Leguminosae. Mixture of steppe and woodland of Central Asian type.

Samples **7** and **8**. Lens 3a. Many charcoal fragments, but the pollen grains are not blackened. AP dominant, and deciduous species dominant within it. Mainly Juglans regia, plus Carpinus, Pterocarya, Juniperus, Buxus, Berberis, Picea, birch and elm. This is another climatic optimum, Belyaeva's third and last, but the question is left open as to its exact status. It may be another phase of the optimum witnessed in sample 4, or it may be completely independent (a little cooler, as shown by the presence of Picea). An anthropogenic effect cannot be excluded.

Sample **9**. Top of 3A. AP, only a few grains of alder. NAP, Carex, Pyrola, Chenopodiaceae, Gramineae. May be signs of climatic worsening.

Layer X

Samples **12** and **13**. Very few traces of pollens or spores.

Layer 2

Samples **15** and **16**. These samples were taken from the section D-F. They are generally similar to the material collected from the vicinity of the Neanderthal remains. There is a marked predominance in all three samples of xerophilous NAP, including Plantago, Ephedra, Euphorbia, Chenopodiaceae. Samples 15 and 16 have less species variability: AP 20%, NAP 57%, spores 23%. AP includes elm, alder, birch, oak, hornbeam, Buxus, Pistacia. NAP also includes Carex, Ranunculaceae, Leguminosae, Liliaceae. Up to 20 NAP taxa were present in the Neanderthal sample, which may in part be due to anthropogenic factors. Spores include Dryopteris, Sphagnaceae and other mosses, and Filicales. In general, the conclusion is that the landscape at this time was open, woods were confined to the Gubs river valley, and the climate was dry and cool.

2.5.1.5 Archaeology

There are >42,000 Mousterian artefacts, mostly small flakes. A detailed description is given of 888 retouched stone tools. Raw material dominated by local dark nodular chert of small size and low quality (90-94%) the remainder being multicoloured flint of higher quality that was imported. Identified tools are dominated by sidescrapers. The most intense occupation occurred in layer 3a. Liubin’s concept of a Mousterian Gubs culture (with comparisons to Barakaevskaya and Gubs rockshelter 1) is defended. The climatic oscillations shown in the pollen analysis, among other things, leads to the suggestion that the occupation of this cave can be dated broadly to the end of oxygen isotope stage 3.

First version 30 June 2004; revised 9 August 2005.

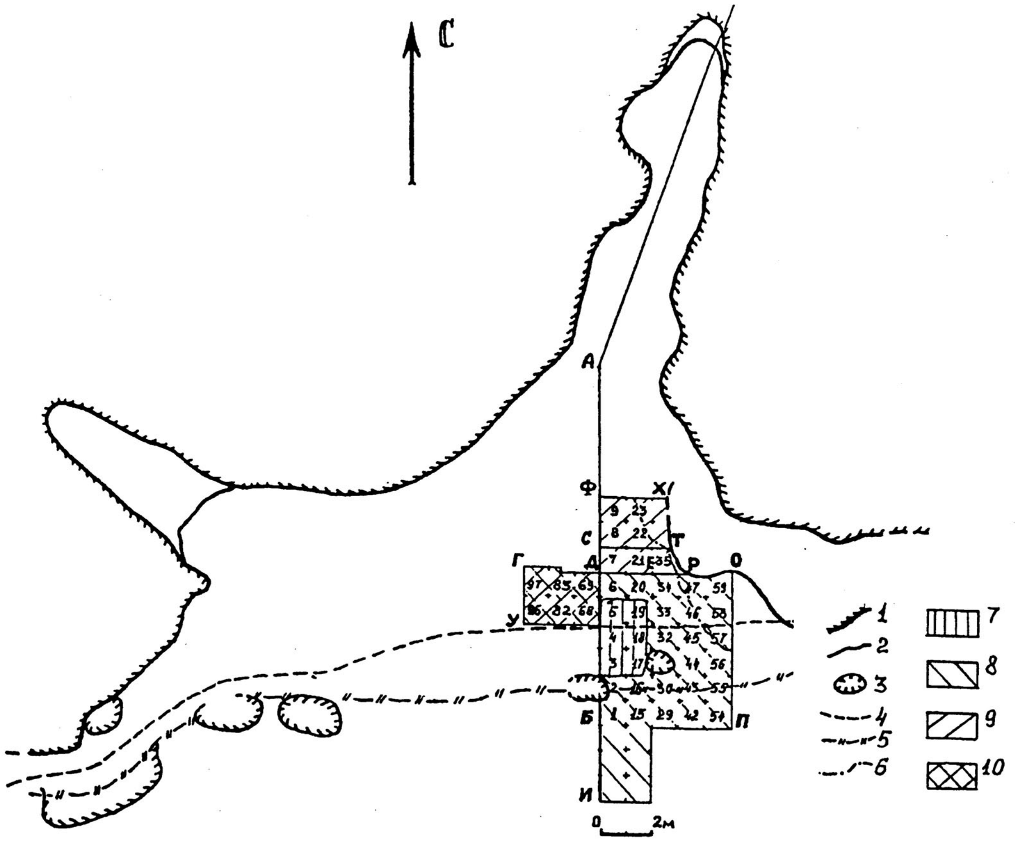


Рис. 7. Монашеская пещера. План:

1 — стена пещеры; *2* — скальная ступень; *3* — известняковые глыбы; *4* — капельная линия; *5* — край площадки; *6* — борт скального желоба в кровле верхнего мустьерского слоя 2; *7* — шурф 1961 г.; *8* — раскоп 1975—1976 гг.; *9* — раскоп 1987—1988 гг.; *10* — раскоп 1990—1991 гг.

Fig. 7. Monasheskaya Cave. Plan:

1 — rock wall; *2* — rock step; *3* — limestone blocks; *4* — drip line; *5* — border line of the cave ground; *6* — outlines of the karstic chute on the top level of the uppermost Mousterian layer 2; *7* — 1961 test excavation; *8* — 1975—1976 excavation area; *9* — 1987—1988 excavation area; *10* — 1990—1991 excavation area

Figure 2.10. Monasheskaya Cave: plan

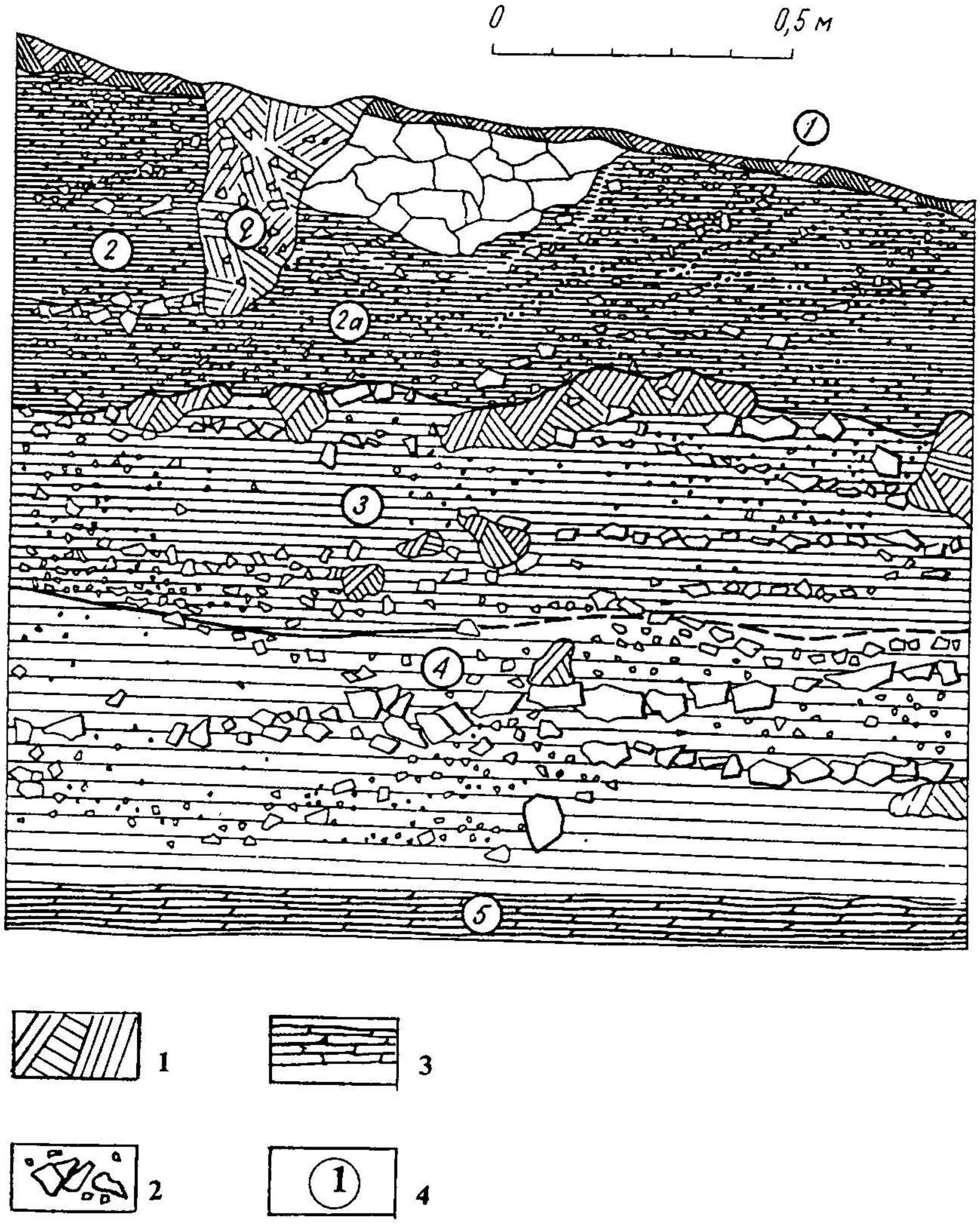


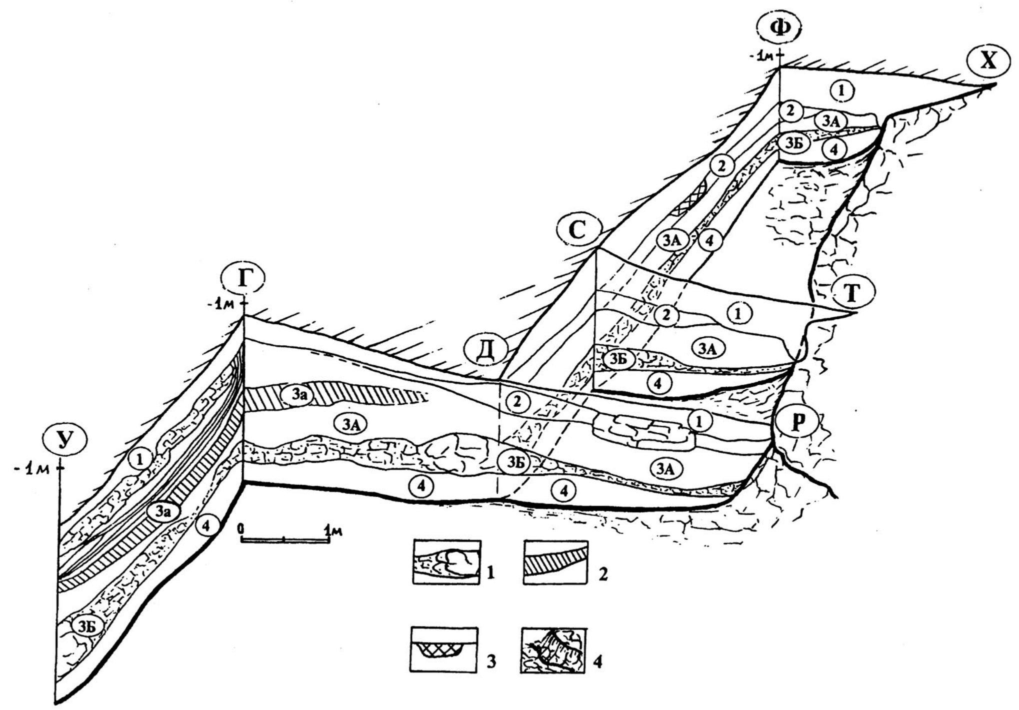
Рис. 9. Монашеская пещера. Разрез шурфа 1961 г.:

1 — голоценовый заполнитель слоя 1, поздних кротовин и ямы (q); *2* — щебень; *3* — известняковый элювий дна пещеры; *4* — номера слоев (по: [Любин, 1977])

Fig. 9. Monasheskaya Cave. Cross — section of sediments in the 1961 test excavation:

1 — holocene deposits in the layer 1, recent burrows and pit (q); *2* — limestone rubble; *3* — limestone eluvium of the cave bedrock; *4* — numbers of the layers (after: [Любин, 1977])

Figure 2.11. Monasheskaya cave: 1961 section



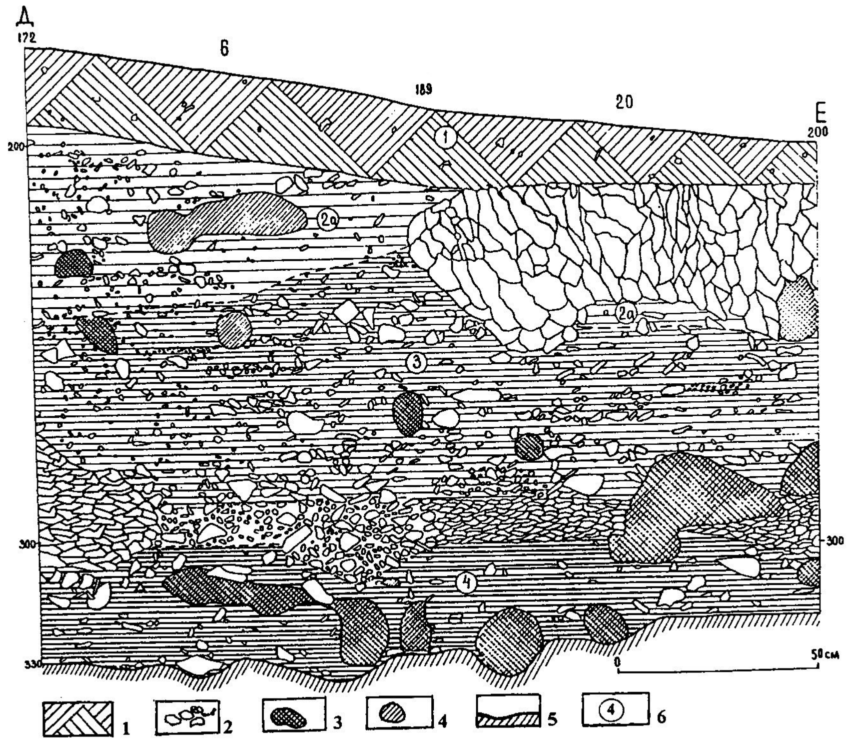


Рис. 11. Монашеская пещера. Поперечный разрез Д—Е:
1 — голоценовый слой; *2* — щебень; *3* — древние кротовины; *4* — поздние кротовины; *5* — скальное дно; *6* — номера слоев

Fig. 11. Monasheskaya Cave. Trahsverse section Д—Е:
1 — holocene layer; *2* — limestone rubble; *3* — ancient burrows; *4* — recent burrows; *5* — cave bedrock; *6* — numbers of the layers

Figure 2.12. Monasheskaya cave: section Д-Е

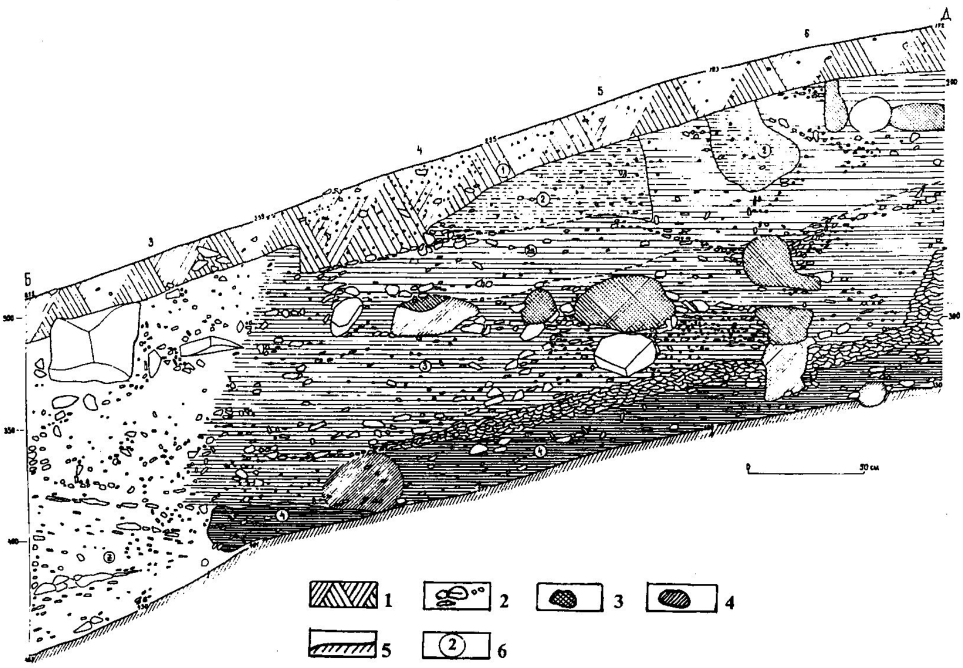


Рис. 12. Монашеская пещера. Продольный разрез Б—Д:
1 — голоценовый слой; *2* — щебень; *3* — поздние кротовины; *4* — древние кротовины; *5* — скальное дно; *6* — номера слоев
Fig. 12. Monasheskaya Cave. Longitudinal section Б—Д:
1 — Holocene layer; *2* — limestone rubble; *3* — recent burrows; *4* — ancient burrows; *5* — cave bedrock; *6* — numbers of the layers

Figure 2.13. Monasheskaya cave: section Б-Д

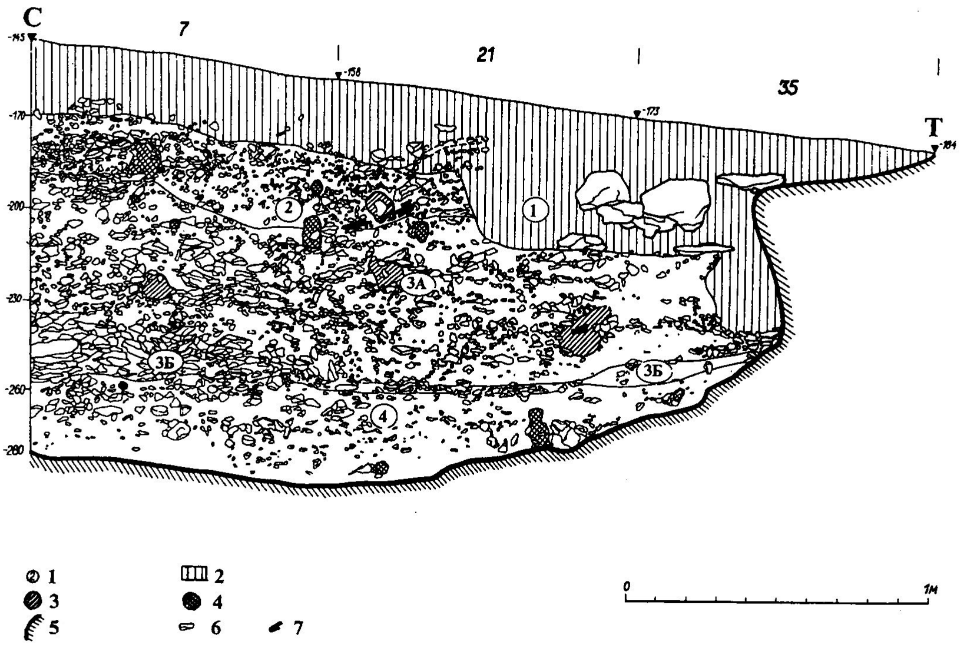


Рис. 13. Монашеская пещера. Поперечный разрез C—T:
1 — номера слоев; *2* — голоценовый слой; *3* — древние кротовины; *4* — поздние кротовины; *5* — скальное дно; *6* — щебень; *7* — кости
Fig. 13. Monasheskaya Cave. Transverse section C—T:
1 — numbers of the layers; *2* — Holocene layer; *3* — ancient burrows; *4* — recent burrows; *5* — cave bedrock; *6* — limestone rubble; *7* — bones

Figure 2.14. Monasheskaya cave: section C-T

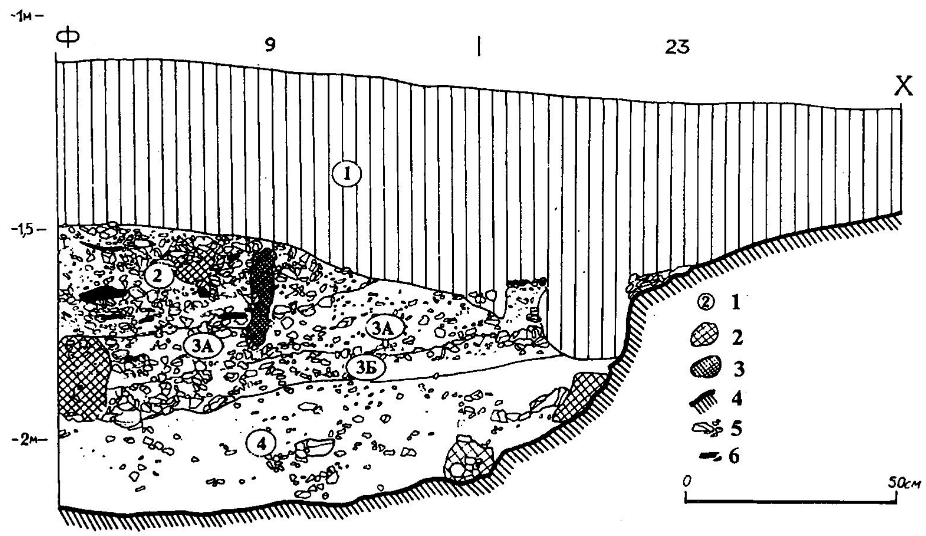


Рис. 14. Монашеская пещера. Поперечный разрез Ф—Х:
1 — номера слоев; *2* — древние кротовины; *3* — поздние кротовины; *4* — скальное дно; *5* — щебень; *6* — кремни и кости
Fig. 14. Monasheskaya Cave. Transverse section Ф—X:
1 — numbers of the layers; *2* — ancient burrows; *3* — recent burrows; *4* — cave bedrock; *5* — limestone rubble; *6* — flint artifacts and bones

Figure 2.15. Monasheskaya cave: section Ф-X

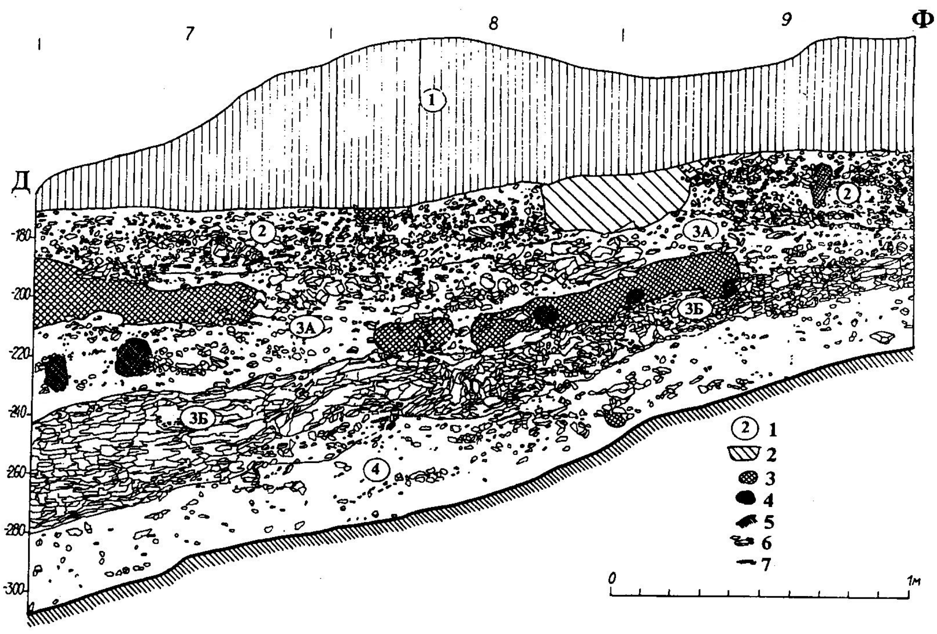


Рис. 15. Монашеская пещера. Продольный разрез Д—Ф:
1 — номера слоев; *2* — средневековое погребение; *3* — древние кротовины; *4* — поздние кротовины; *5* — скальное дно; *6* — щебень; *7* — кости и кремни
Fig. 15. Monasheskaya Cave. Longitudinal section Д—Ф:
1 — numbers of the layers; *2* — medieval burial; *3* — ancient burrows; *4* — recent burrows; *5* — cave bedrock; *6* — limestone rubble; *7* — flint artifacts and bones

Figure 2.16. Monasheskaya cave: section Д-Ф

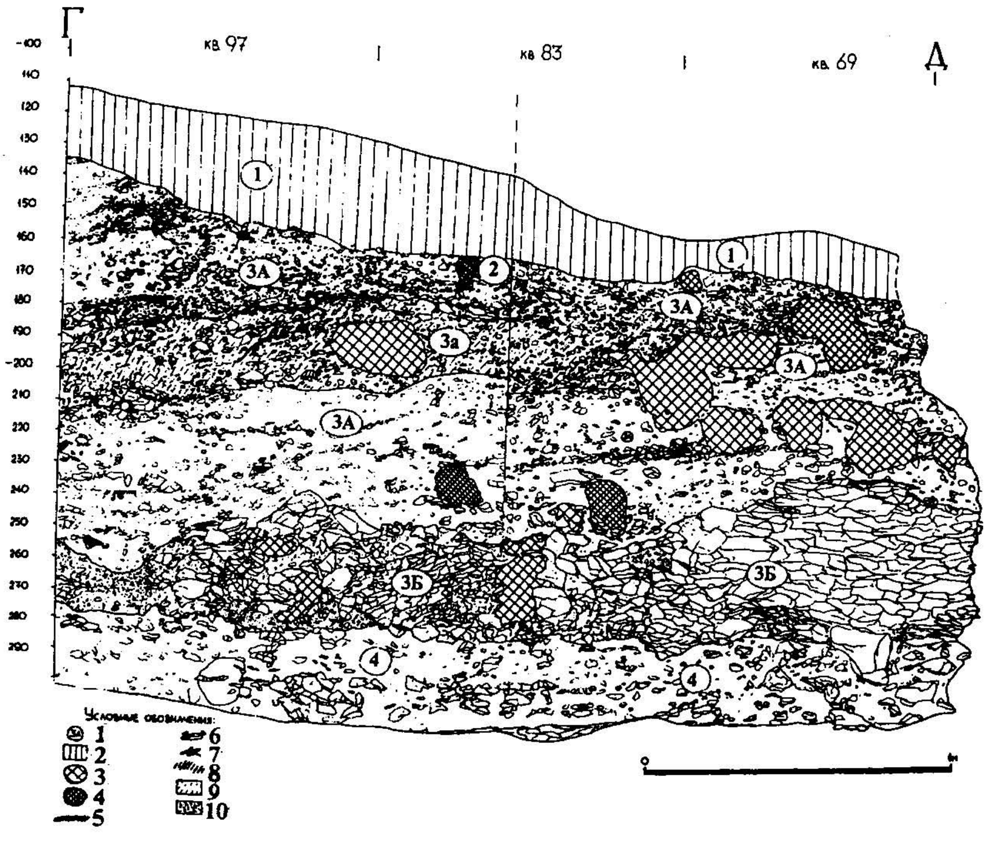


Рис. 16. Монашеская пещера. Поперечный разрез Г—Д:

1 — номера слоев; *2* — голоценовый слой; *3* — древние кротовины; *4* — поздние кротовины; *5* — углистые прослойки; *6* — щебень; *7* — кости; *8* — темноокрашенная прослойка; *9* — основной уровень обитания в слое 3А—3а; *10* — известняковая крошка (хрящ)

Fig. 16. Monasheskaya Cave. Transverse section Г—Д:

1 — numbers of the layers; *2* — Holocene layer; *3* — ancient burrows; *4* — recent burrows; *5* — streaks with ash and burnt bones; *6* — limestone rubble; *7* — bones; *8* — dark-coloured streak; *9* — level of the most intensive occupation within the layer 3A — lens-like horizon 3a; *10* — crumble limestone

Figure 2.17. Monasheskaya cave: section Г-Д

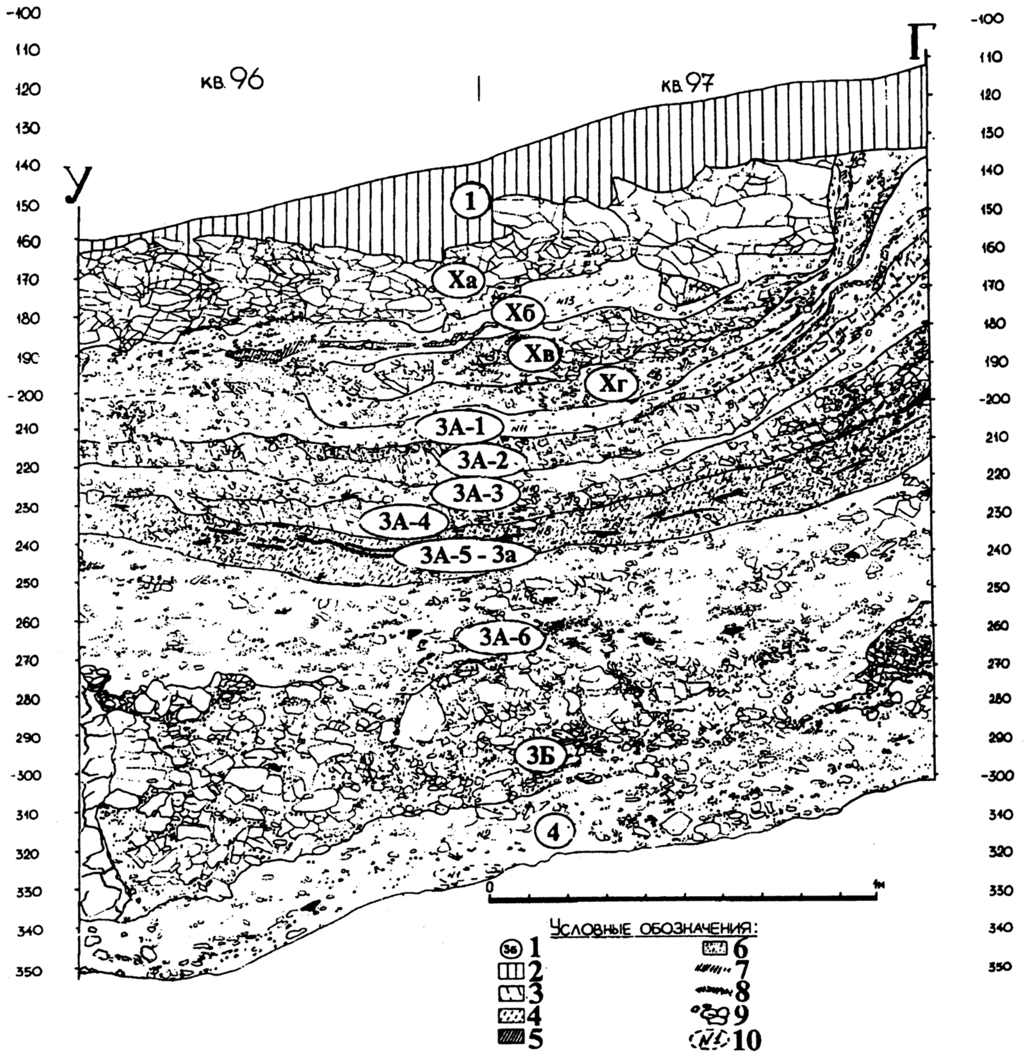


Рис. 17. Монашеская пещера. Продольный разрез У—Г:

1 — номера слоев; *2* — голоценовый слой; *3* — прослой белесоватой супеси с обилием мелкого известнякового щебня; *4* — основной уровень обитания в слое 3А — горизонт 3а (= прослой 3А-5 в данном разрезе); *5* — темноокрашенная прослойка; *6* — известняковая крошка (хрящ); *7* — углистые прослойки; *8* — прослойки разложившейся кости; *9* — щебень; *10* — кости; *11* — образцы на пыльцу

Fig. 17. Monasheskaya Cave. Longitudinal section У—Г:

1 — numbers of the layers; *2* — Holocene layer; *3* — streak of whitish sandy loam with abundance of small limestone rubble; *4* — level of the most intensive occupation within the layer 3A — horizon 3a (= streak 3A-5 in this sediment section); *5* — dark-coloured streak; *6* — crumble limestone; *7* — streaks with ash and burnt bones; *8* — streaks with decomposed bones; *9* — rubble; *10* — bones; *11* — samples for the pollen analysis

Figure 2.18. Monasheskaya cave: section У-Г

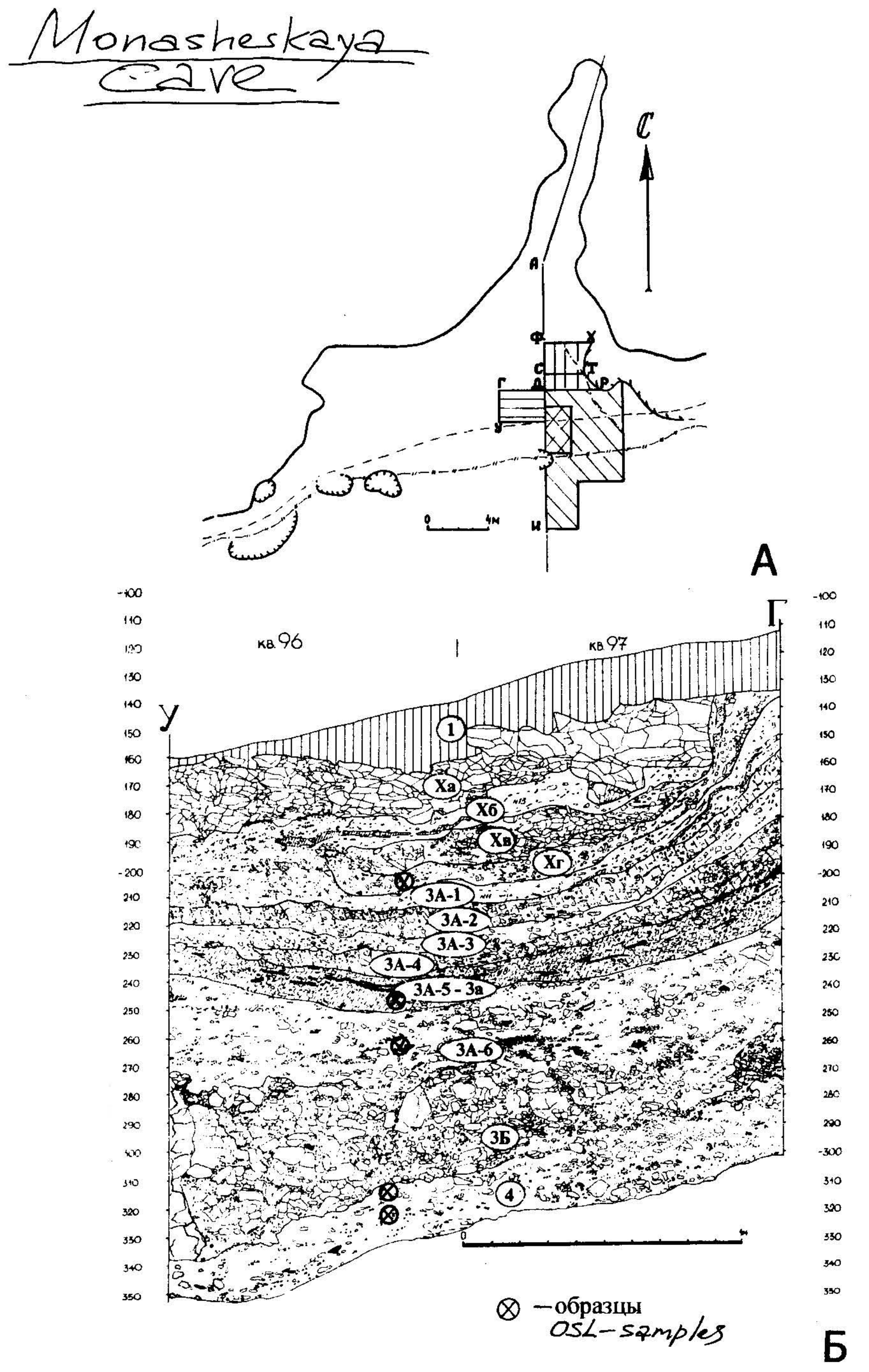


Рис. 8. Монашеская пещера: А – План пещеры с указанием разреза У-Г, откуда брались образцы; Б – Разрез У-Г с указанием точек взятия образцов

Figure 2.19. Monasheskaya, 2004 section with OSL sample positions

Monasheskaya rodent species and numbers by layer

Таблица 1

Видовой состав и количество костных остатков мелких млекопитающих из Монашеской пещеры (раскопки 1975—1976, 1987—1991 гг.; по Г. Ф. Барышникову)

Виды	Соврем. слой 1	Кротовины	Мустьерские слои						Всего
			2	3А			3Б	4	
				гор. 1	гор. 2	гор. 3			
1	2	3	4	5	6	7	8	9	10
Talpa caucasica Sat. (крот)	4								4
Lepus europeus Pall. (заяц-русак)	2								2
Marmota sp. (сурок)		51 *							51
Erinaceus sp. (еж)							1		1
Sorex sp. (землеройка)				9			1		10
Soricidae indet.		1							1
Ochotona pusilla lioubini (пищуха)			3	10	3	2			18
Spermophilus sp. (суслик)				21	25	9	18	9	82
Spalax microphtalmus (обыкн. слепыш)			1	6	3	1		2	13
Apodemus sp. (лесная мышь)	4	1	1		1				7
Ellobius talpinus (обыкн. слепушонка)			1		1				2
Cricetulus migratorius (сер. хомячок)				3	5	1	16	4	29
Cricetus cricetus (обыкн. хомяк)	1			4	3	7	20	5	40
Arvicola terrestris (водян. полевка)	1			1	1	1	7	3	14
Chionomys nivalis (снеговая полевка)	1		2	2	12	3	2	1	23
Chionomys gudini (гудаур. полевка)						2			2
Pitymys majori (кустарн. полевка)			1				1		2
Micritus arvicola (серая полевка)							13		13
Microtus arvalis (обыкн. полевка)			5	5	9	8		8	35
Arvicolidae indet.	4		20	49	68	62	79	21	303
Chiroptera indet.				4	5		2		11
Rodentia indet.						1			
Citellus cf. musicus Men. (эльбрус. горн. кавк. суслик)					2			4	9
Apodemus flavicollis (желтогорлая мышь)		1							1
Apodemus agrarius Pall. (полевая мышь)		114							114
Всего	17	168	34	114	138	97	160	60	788

* An almost complete skeleton of Marmota was discovered in its nest. According to Baryshnikov, the extinction of this animal came about because of environmental changes at the end of the Pleistocene and the beginning of the Holocene.

Table 2.3. Monasheskaya cave: rodent species by number and layer

2.5.2 Gubs Rockshelter 1

According to preliminary information (Liubin et al., KSIA, 1973) sites in this area were first located by P.U. Autlev in 1961. There are 11 caves and rock shelters in the karst canyon of the Gubs river, which flows into the river Laba, about 40-45 km south east of Maikop, in the broader region which is known as the Prikubanye. The sites form a chain on the northern side of the Borisov gorge, hidden from the wind, with a southward facing exposure, in the vicinity of several springs, and good flint sources. Autlev excavated Monasheskaya and Gubs rock shelter 1 in 1962-63, at the same time as A.A. Formozov excavated Gubs rock shelter 7. The first two sites were visited by a team of archaeologists and geographers, including V.P. Liubin and V.M. Muratov, in 1964, and the published report relies essentially on their observations.

2.5.2.1 Excavations of 1962-63

Gubs rock shelter 1 is at a height of 90-100 metres above the river in an upper tier of karst shelters, where the sheer precipice of the canyon wall joins the steep lower slopes. The cave is oriented to the SSE (plan in Liubin et al., Fig. 1A). At the present time it forms a wide shallow niche 18 metres in length, only partly overhung by the cave roof. The distance from the drip line to the rock wall is no more than 6-7 metres, but in front there is a platform measuring 5 metres from front to back. The total size of the available living space at present amounts to about 198-216 square metres (11-12 x 18 m) and in the past it will presumably have been free of the large fallen blocks which now obstruct the western part of the site.

The position of Autlev's trench ('1') is indicated on the plan. It is 6.8 metres long and 2 metres wide (13.6 square metres in all). In 1964 the visiting team cleaned back the southern wall of the trench and the stratigraphy was re-drawn by V.M. Muratov. This forms the section illustrated in the published report (Liubin et al., Fig. 1B). On the drawing the eastern side is on the left and the western side is on the right. The slope downwards is reflected in the figures for height shown in the horizontal line transecting the cave on the plan in Fig. 1A (measurements varying from -900 to -194). The overall thickness of the deposits amounts to 1.7-1.75 metres. Muratov distinguished 8 lithological horizons, the numbers of which are indicated on the section. Their characteristics are summarised in a table on pages 57-58 of the published report, which also includes information about the material excavated by Autlev.

Gubs Rockshelter 1 stratigraphy (1962-63)

The layers as defined by Muratov are as follows.

(1) Humus horizon. 5-9 cm.

(2) Light yellowish sand, up to 80% fine grained, with a gravel and small-sized rubble component (mean diameter of stones 1-3 cm). There are at least three intercalated lenses of calcareous material (2a). Boundaries of layer well defined. 60-70 cm.

(3) Blackish brown sand, analogous to layer 1, but darker. Boundaries clear, with pockets. Referred to by Autlev and Formozov as an ash lens, redefined by Muratov as a buried humified horizon. 3-15 cm.

(4) Brick red sand, in places sandy loam, fine grained but with gravel and rubble inclusions. Identified by Muratov as a burnt layer. The rubble is sharp edged (mean diameter of stones 2-5 cm) with some slabs (mean diameter up to 15 cm). Uneven boundaries. 2-15 cm.

It is pointed out in the text that both (3) and (4) are essentially intercalated deposits within the matrix of layer (2), and this can be clearly seen in the drawn section, especially in the central and eastern part beneath layer (4). It was considered in 1973 that the nature of layers 3 and 4 would merit further investigation.

Layers 2-4 contain Upper Palaeolithic archaeological material. A little fauna was recovered and identified by N.K. Vereshchagin: horse, souslik, and mole rat. In the central and western parts of the section, the Upper Palaeolithic deposits rested directly on the Middle Palaeolithic ones beneath, but (as shown in the section) this was not so in the eastern part, where there was a substantial rock fall horizon between them.

(5) Yellowish brown sand, in places sandy loam, occupies up to 40% of the deposit, but is heavily packed with rubble in the upper part, where there is a poorly marked transition to the rock fall horizon. 20-30 cm.

(6) Similar to 5 but lighter in colour with less rubble. Boundaries not very clear. 5-25 cm.

(7) Similar to 5 but with a finer matrix, except in the upper part which (as in 5) is heavily packed with rubble. Boundaries clearly marked. 20-30 cm.

(8) Greenish grey eluvial horizon. Limestone base. 5-15 cm.

Layers 5–7 contain Middle Palaeolithic archaeological material. Some fauna was recovered and at least approximately identified by N.I. Burchak-Abramovich and I.M. Gromova: a passerine bird, and a hamster-like rodent about the size of a water vole. In the text, the presence of exfoliated rubble concentrations at the top of layers 5 and 7 was emphasised. They were interpreted as indicative of the predominance of frost induced rather than chemical weathering processes at the site at this time. The faunal and floral evidence is held to support the idea that a dry and cool climate prevailed in what was predominantly a steppe landscape.

Palynological evidence

A pollen sample sufficient for analysis was recovered not from the soil itself, but from some cavities in long bones taken from the Middle Palaeolithic layers, while they were being examined in Maikop. The results are tabulated on page 58 of the report by Liubin et al. (1973). The total number of specimens counted is 682, of which 6 could not be identified. AP accounts for 6% of the total, NAP is 94%. The numbers tabulated are actual grain counts for AP, and %s for NAP. Comments in the text on the tabulated results are as follows.

The composition and abundance of NAP shows that the catchment area was quite large. This is indicated by the frequency of Compositae (many of which grow on disturbed ground) and Chenopodiaceae (some of which grow in similar conditions and on salt marshes by rivers). The AP contains both coniferous and deciduous species, and indicators of pioneer growth (by which is probably meant birch, colonising rocky ground). In general, it is clear that the area was more open and less wooded than it is now. The presence of birch is taken as an indicator that the boundary of the sub-Alpine zone was lower than at present, and consequently the boundaries of all zones will have been lower as well. But the presence of deciduous trees (such as hornbeam and beech) shows that the lower boundary of the true coniferous belt (with Pinus and Abies) still lay above the position of the site. In sum, the authors conclude that the boundaries of the vegetation zones in general will have been about 600-700 metres lower than at present, and on that basis they calculate that there will have been a lowering of summer temperatures by about 3.5-4.5° C.

Archaeological material

The Upper Palaeolithic excavated material amounts to 2170 pieces, including 46 cores and 131 tools. It was not further analysed in the published article. The Middle Palaeolithic excavated material amounts to 682 pieces. 33 bladelets of Upper Palaeolithic appearance were excluded from the calculations, since it was felt that they were probably intrusive from above (a circumstance that could easily arise given the relationship between layers 4 and 5). The Middle Palaeolithic layers were considered to be quite heavily occupied, since (it was calculated) there were 48 pieces per one square metre of excavated area. There were relatively few cores, which suggested that they were probably worked outside the confines of the rock shelter. The average size of the artefacts is small, usually in the range 3-5 cm. There were 485 flakes and blades. 80 tools were listed according to the Bordean system on page 61 of Liubin et al. (1973). These include 15 unretouched Levallois flakes and blades, 29 sidescrapers, 5 endscapers, and 12 denticulates. IR = 44.6. Generally speaking, it was felt that the assemblage was comparable to Bordes's Typical Mousterian, but since this assemblage was very similar to that from Monasheskaya, it was proposed to create a separate Gubs culture to embrace them both. In view of the presence of some non-intrusive Upper Palaeolithic elements, it was surmised that this was a Late Mousterian, but this is entirely a typological judgement.

2.5.2.2 Excavations of 1975

Excavations at the site were carried out for a second time by Kh. A. Amirkhanov, in collaboration with Autlev, in 1975 (Amirkhanov, 1986). Amirkhanov concentrated his efforts on the Upper Palaeolithic, but his stratigraphic observations relate to the site as a whole. His composite plan indicates the position of both old and new excavations, the newly opened squares being directly adjacent to those of 1962-63 (Amirkhanov, Fig. 5). The obliquely hatched area (labelled '1') indicates the presence of a medieval burial ground which (it is now clear) hindered the full recognition of the Upper Palaeolithic sequence at the time of the first investigation. The horizontally hatched area shows Amirkhanov's excavated squares 4-7. A new section, 2.8 metres thick, "on the northern line" of square 4, was published by Amirkhanov (Fig. 6), the details of which are as follows.

Gubs Rockshelter 1 stratigraphy (1975)

The layer numbering follows that of Amirkhanov.

(1) Present day soil. 12-25 cm.

(2) Brown loam with fine rubble and gravel. **Upper Pal cultural layer 1**. 10-17 cm.

(3) Greyish-yellow loam with gravel and a little angular rubble. Archaeologically sterile. 9-13 cm.

(4) Whitish loam with gravel, high carbonate content. Archaeologically sterile. 5-8 cm.

(5) Analogous to (3). 17-23 cm.

(6) Analogous to (4). 6 cm.

(7) Analogous to (3) and (5). 10-11 cm.

(8) Ashy, humified. A buried soil? **Upper pal cultural layer 2**. 8-10 cm.

(9) Analogous to (3) (5) and (7). 4-5 cm.

(10) Analogous to (4) and (6). 5-8 cm.

(11) A collapse horizon? Sandy soil with some limestone blocks and much coarse rubble. In places the matrix is coloured rust-red, due to the effects of ferric oxide, consequent on the destruction of small ferruginous concretions. The limestone material also shows signs of decomposition. 12-14 cm.

(12) Light and dark brown loam with fine and medium sharp edged rubble and gravel. 20-30 cm.

(13) Brownish-yellow sandy soil with some sharp edged rubble and much gravel. 23-30 cm.

(14) Dark brown loam with much decomposed rubble and some gravel. **Mousterian cultural layer 3**. 20-23 cm.

It will be seen that this sequence is generally similar to that described by Muratov. In particular, his layers (3) and (4) correspond to Amirkhanov's (8) and (11). The recognition of two Upper Palaeolithic cultural layers is new. Amirkhanov ascribes the totality of the old finds to Cultural layer 2, the excavated portion of which now covers about 16 square metres. In 1975 two hearths were discovered in this layer. Cultural layer 1 was located only in 1975 and covers about 3 square metres; Amirkhanov is of the opinion that it could not have been recognised by Autlev in the portion dug by him due to disturbance from the medieval burial ground.

A little new fauna from the Upper Palaeolithic layers was recognised by G.F. Baryshnikov, to add to the three species already identified by Vereshchagin: a vole, an artiodactyl, 2 bison, and 2 sheep/goat. The numbers are not great enough to permit palaeo-environmental reconstruction, but a significant new pollen and spores sequence was established for the entire section, thanks to a study carried out at Leningrad university (it is not said by whom). The details given by Amirkhanov are as follows.

Palynological sequence

15 samples were allocated to 8 zones (numbered 2-9) corresponding to the stratigraphic layers at the site, as shown in this table, which has been compiled on the basis of Amirkhanov's summary.

Zone	Layers	AP%	NAP%	Comments
2	1	5-7	dominant	AP: maple NAP: Artemisia, Chenopodiaceae, Asteraceae, varia.
3	2	-	-	no pollen or spores
4	3	45	22	AP: fir, spruce, pine; oak, elm, ash, hornbeam, hazel, alder, willow, cornel, birch, Zelcova. NAP: varia, Cyperaceae, Chenopodiaceae, Asteraceae. Moist climate indicated. AP in valley (?) not unlike montane zone at present.
5	4-7	3-5	92-95	AP: pine. NAP (in order): 1 varia 2 Asteraceae 3 Chenopodiaceae 4 Artemisia. Dry and cold, periglacial wooded steppe.
6	8	?	?	AP: hazel, maple. NAP: varia. Treeless watershed, wooded valley.
7	9-12	12	dominant	AP: pine, oak, maple, honeysuckle, alder, willow. NAP: varia.
8	13	0	92	NAP: 1 Asteraceae 2 varia 3 Cyperaceae 4 Chenopodiaceae. Periglacial steppe.
9	14	-	-	NAP: Asteraceae, Chenopodiaceae, varia. Only a few grains, insufficient to reconstruct climate.

There are some fairly obvious problems with the way in which the data has been summarised. %s are not always given for AP and NAP; they do not add up to 100%, the remainder presumably being taken up by spores; and there is a general lack of precision. Amirkhanov points out that there are two warmer and damper phases corresponding to layers 3 and 8. He thinks that these may correspond to Lascaux (16-17 kyrs ago) and Bryansk (25-29 kyrs ago) respectively, and in his view the nature of the archaeological material would agree with this. It should be noted that (if these correspondences are correct) Upper Palaeolithic cultural layer 2 would occur in an interstadial period, but Upper Palaeolithic cultural layer 1 would be later than the climatic amelioration detected in layer 3. Lithologically layers 2 and 3 are very similar, hence (despite the absence of pollen in layer 2) Amirkhanov considers it possible that the warmer climatic conditions may in fact have continued at that time. Since Upper Palaeolithic cultural layer 2 is identified as “mid” upper palaeolithic, then as Amirkhanov says the period corresponding to the “early” upper palaeolithic (not represented here, equivalent to layers 9-11?) may also have been fairly mild. Despite the existence of a postulated “collapse horizon” in layer 11, Amirkhanov considers that the sequence of deposits through from the Middle to the Upper Palaeolithic was continuous, without signs of a major break.

Archaeological material

Amirkhanov's description is confined to the Upper Palaeolithic.

Upper Palaeolithic cultural layer 2. Combining the material from all the excavation years (1962-63 and 1975) Amirkhanov states that there were 4590 pieces in total, or 286 per square metre. There are 55 cores and 163 tools, the remainder being flakes and blades and debitage fragments. Endscrapers are the most numerous tool class, 109 altogether, of which 46 can be classified as nosed or carinate (Amirkhanov, 1986, Fig. 9.15 and 17). These are commonly regarded as Aurignacian-type artefacts, although Amirkhanov does not claim that this is so in this case. As he says, there are no points or backed blades, or geometric pieces, therefore the assemblage is radically different from the second upper palaeolithic assemblage. The site remains the only one in the northern Caucasus where Upper and Middle Palaeolithic are superimposed, and this is also the only site in the area with a "mid" upper palaeolithic.

Upper Palaeolithic cultural layer 1. The material excavated in 1975 amounts to 513 lithic pieces plus one bone awl, or 170 per square metre. There are 6 cores and 33 tools, as well as flakes and blades and debitage fragments. There are 9 points (including 4 Gravette points) and 10 backed bladelets, but no geometric microliths, therefore the assemblage is classified as "late" upper palaeolithic.

2.5.2.3 Comments

Since this is the only site in the northern Caucasus with superimposed Upper and Middle Palaeolithic, it has an obvious importance. Cultural layer 2 is described as "mid" Upper Palaeolithic, but it seems to have some Aurignacian-type characteristics, and may therefore be relatively "early". At the very least, it will provide a terminus ante quem for the Middle Palaeolithic in the area. As emphasised by previous excavators, Muratov's layers 3 and 4, corresponding to Amirkhanov's layers 8 and 11, are quite distinctive and worth investigating in their own right. The palynological characteristics of the Middle Palaeolithic layers are said to resemble the uppermost Middle Palaeolithic layer at Monasheskaya, which according to G.M. Levkovskaya corresponds to the end of oxygen isotope stage 3. But so far the site remains totally undated.

The new section drawn in 2004, from which the samples were taken, should be in close proximity to Amirkhanov's 1975 section, and does in fact resemble it, as the photograph makes clear.

first version 17 June 2004; revised 6 August 2005.

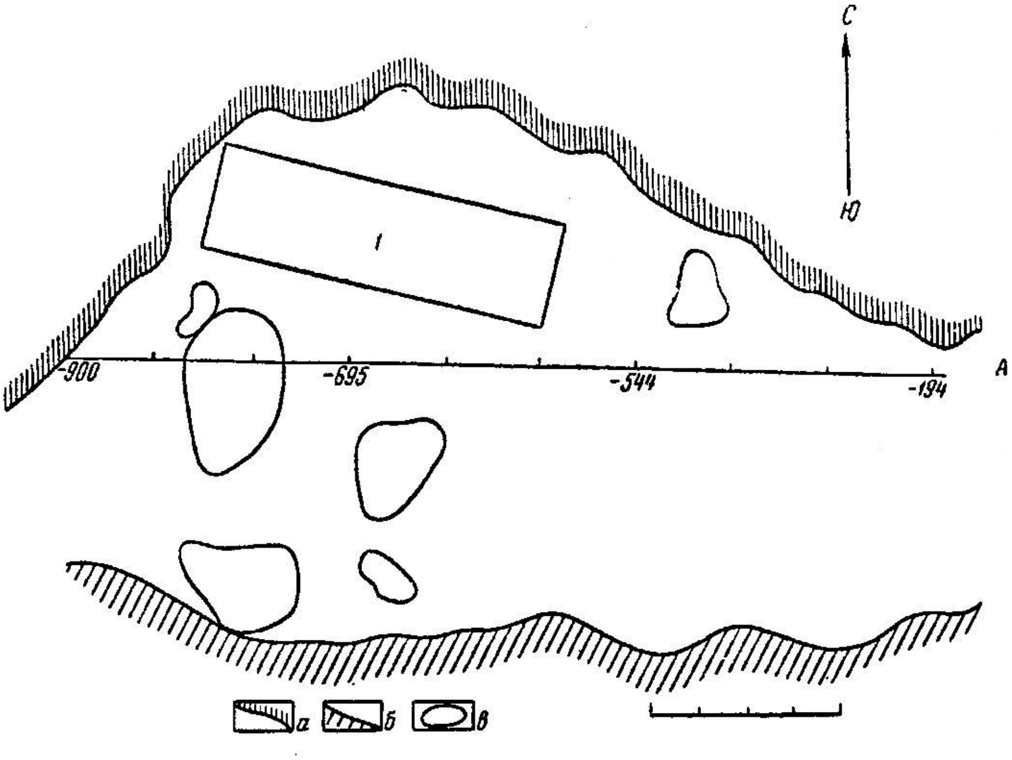


Figure 2.20. Gubs Rockshelter 1, plan in Liubin *et al*. (1973, fig. 1A)

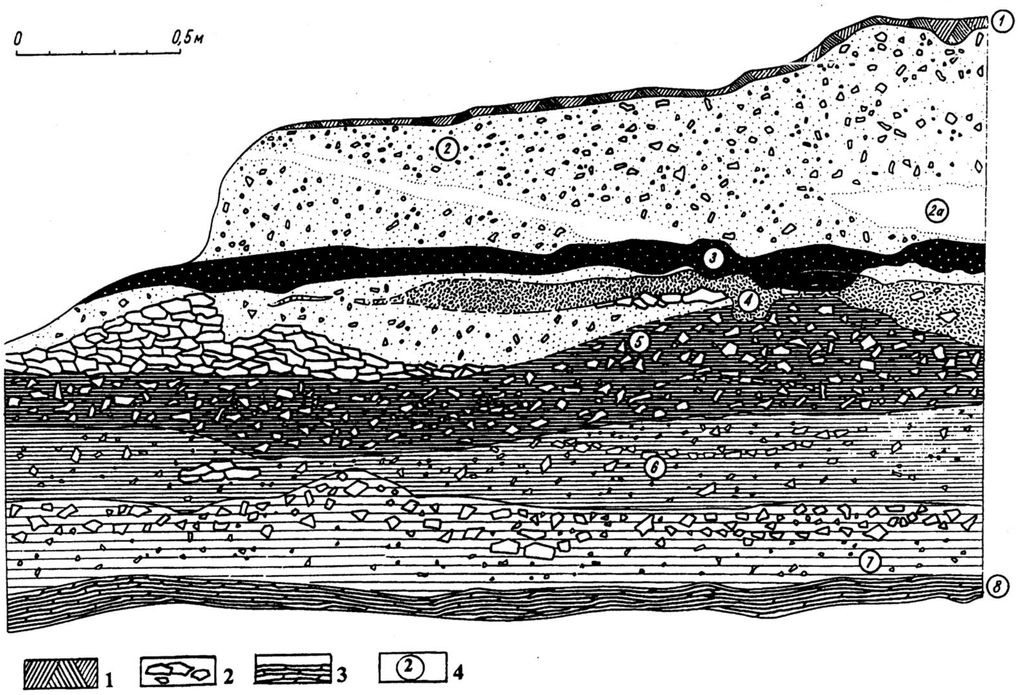


Рис. 71. Губский навес № 1. Разрез отложений:
1 — голоценовый слой; *2* — щебень; *3* — известняковый элювий скального дна; *4* — номера слоев (по: [Любин, 1977])

Fig. 71. Gubski № 1 Rock-shelter. Cross-section of sediments:
1 — holocene layer; *2* — limestone rubble; *3* — limestone eluvium of the cave bedrock; *4* — numbers of the layers (after: [Любин, 1977])

Figure 2.21. Gubs Rockshelter 1, section in Liubin *et al*. (1973, fig. 1B)

Древесные породы	Число зерен	Древесные породы	Число зерен
Abies Nordmanniana	2	Ulmus sp.	4
Pinus silvestris	3	Carpinus betulus + C. orientalis	3
Betula sect. Albae (B. Pubescens и др.)	12	Fagus	1
Quercus sp.	2	Alnus glutinosa + A. incana	8
Tilia platyphyllos + T. caucasica	6	Corylus	3
Травянистые растения	**%**	**Травянистые растения**	**%**
Gramineae	1	Polygonaceae	<1
Chenopodiaceae (Ch. album, Ch. chenopodioides, Atriplex tatarica, A. patula, Eurotia ceratoides, Echinopsilon sedoides и др.)	17	Umbelliferae	<1
		Labiatae	<1
		Cruciferae	<1
		Неопределенные	6
Artemisia	10	Общее число подсчитанных пыльцевых и споровых зерен	682
Compositae	62		
Caryophyllaceae	<1	Пыльца древесных пород	6%
Valerianaceae	2	Пыльца травянистых растений	94%

Table 2.4. Gubs Rockshelter 1, pollen table in Liubin *et al*. (1973, 58)

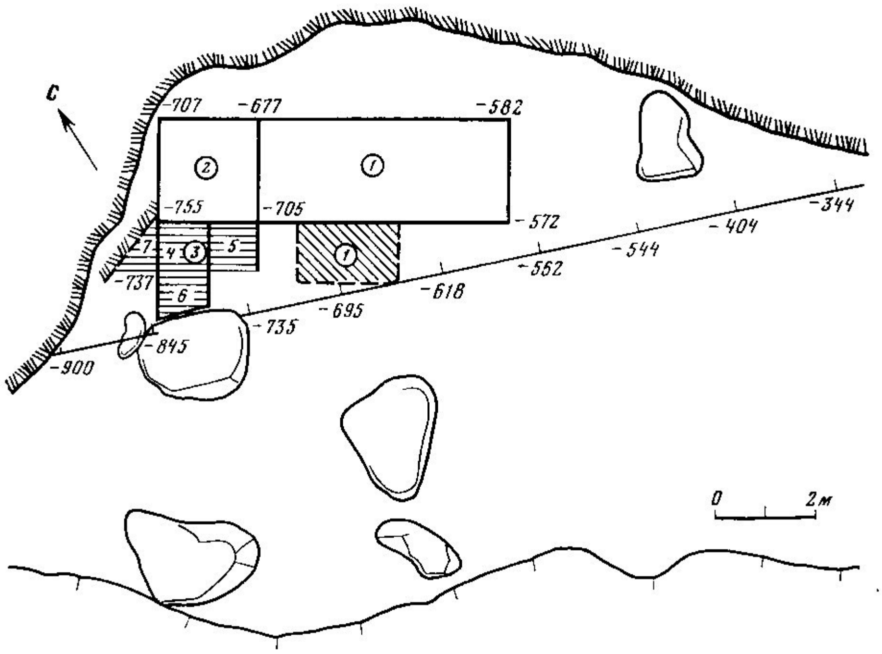


Рис. 5. Сводный план раскопок Губского навеса

1, 2 — раскоп 1962—1963 гг.: *1* (с косой штриховкой) — средневековое погребение; *3* — раскоп 1975 г.; *4—7* — квадраты раскопа

Figure 2.22. Gubs Rockshelter 1, plan in Amirkhanov (1986, fig. 5)

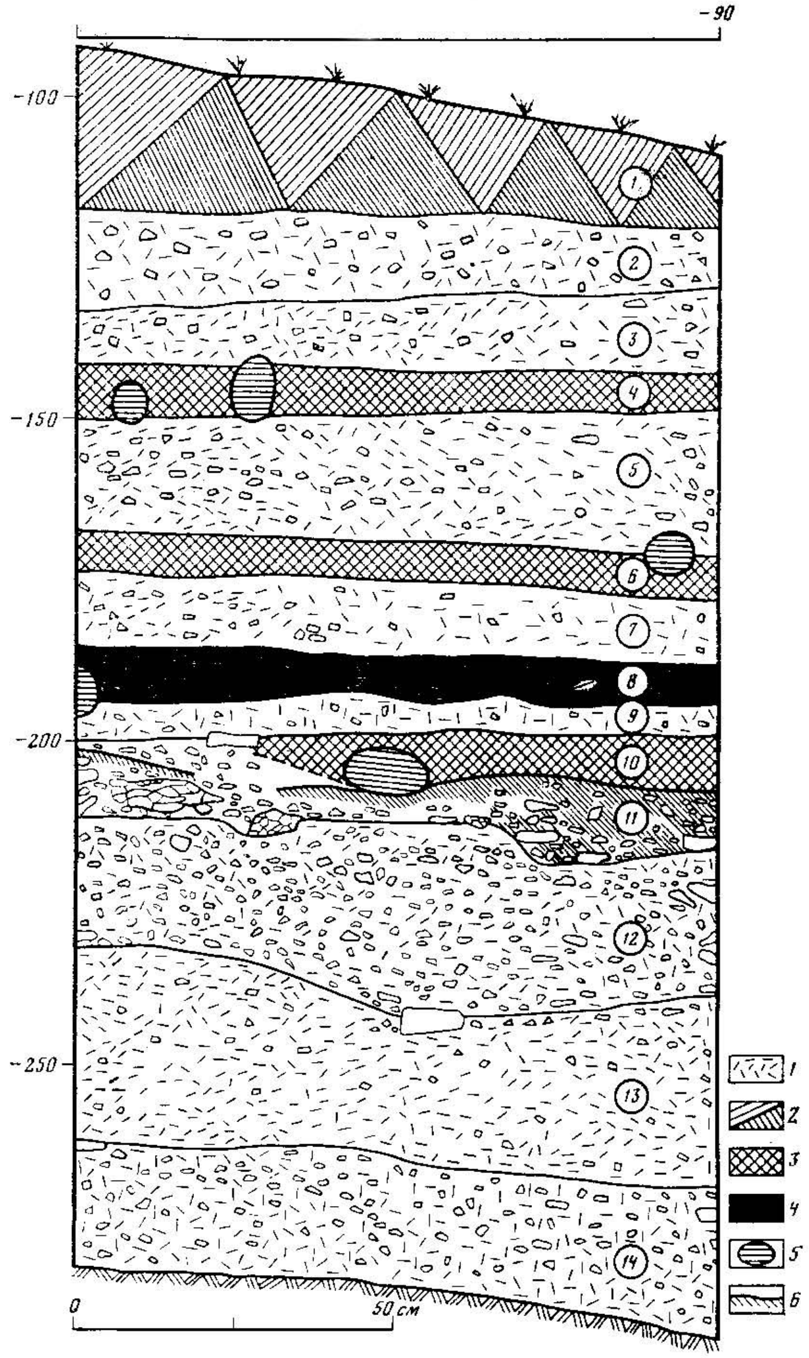


Рис. 6. Разрез отложений Губского навеса 1 по северной линии квадрата 4

1 — дресва, *2* — современная почва, *3* — суглинок, *4* — золистость и гумусированность, *5* — кротовины, *6* — розоватая окрашенность окисью железа

2 Х. А. Амирханов

Figure 2.23. Gubs Rockshelter 1, section from Amirhkanov (1986, fig. 6)

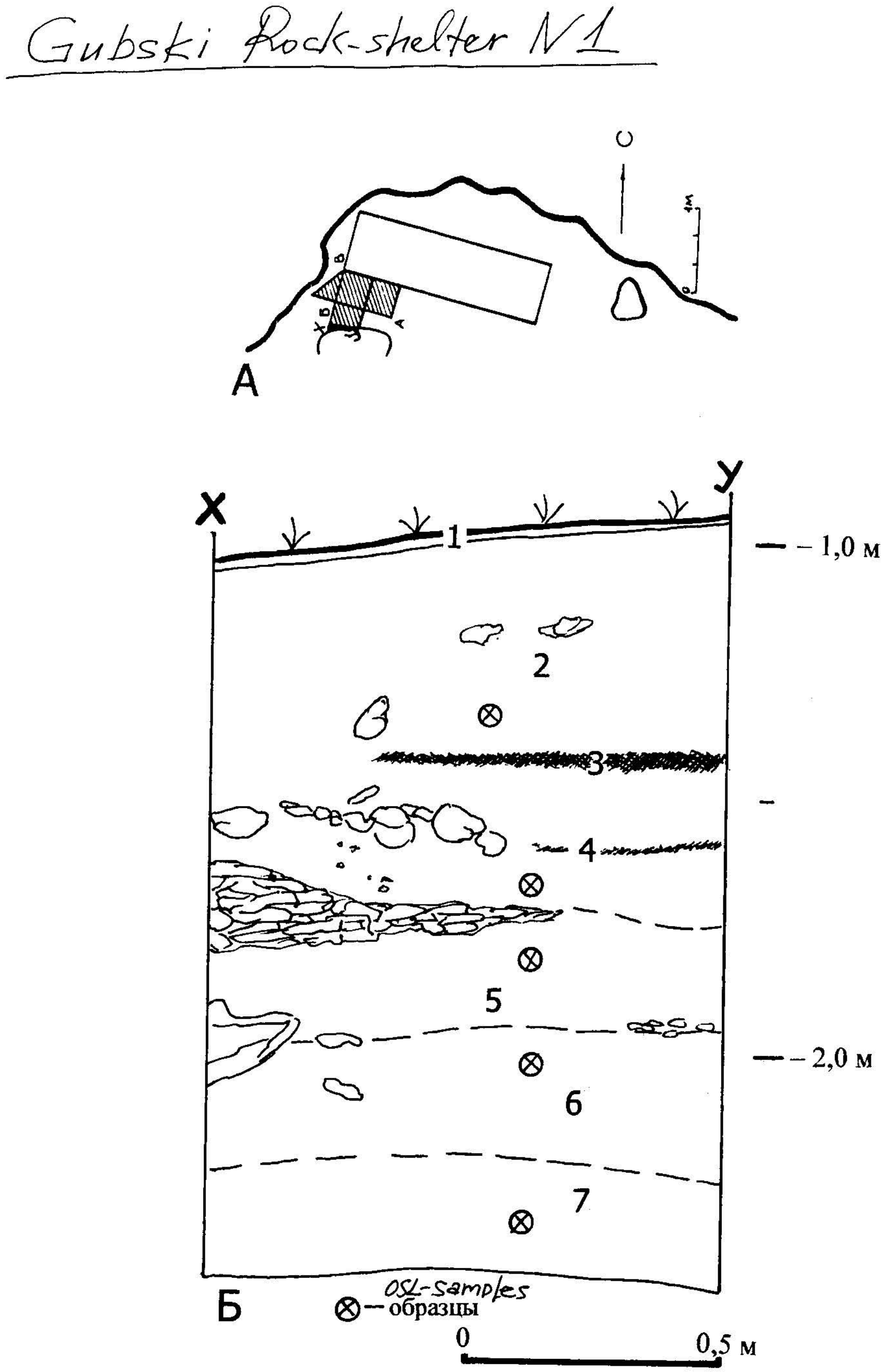


Рис. 10. Губский навес № 1. А – План навеса с указанием разреза Х-Y, откуда брались образцы; Б – Разрез Х-Y с указанием точек взятия образцов

Figure 2.24. Gubs Rockshelter, 2004 section with OSL sample positions

2.5.3 Barakaevskaya

Summary in Liubin (1989, L'Anthropologie 1998), ed. Liubin (1994), Belyaeva (1999: 154-163).

A small karst cave in the Borisov gorge of the river Gubs canyon in the basin of the Kuban river. In the foothills of the Skalisty ridge, 40-50 km south-east of Maikop, in the Mostov region of the Krasnodar district. Absolute height 800-900 metres above sea level, relative height 73 metres. Entrance faces south. Length 9 m, maximum width 5-6 m, maximum height at the entrance 2.4 m. In the past the cave was 2-3 metres longer. Its entrance was covered by a rock overhang, which collapsed at the beginning of the Holocene. Discovered by P.U. Autlev in 1962, excavated by Liubin and Autlev in 1976-1977, 1979-1981. Other specialists took part in the work, and their contributions form part of the book edited by Liubin on "The Neanderthals of the Gubs ravine" (1994). Leaving the witness section out of account, the cave has been completely excavated (35 square metres). 5 transverse and longitudinal sections, maximum thickness 85 cm.

2.5.3.1 Stratigraphy

(1) loose humified loam, with a small amount of rubble and limestone blocks, and ashy lenses. 10-70 cm. Later prehistoric remains (Neolithic to Mediaeval).
(2) a dark brown phosphate-carbonate crust, formed by solution. In 5 places broken through by hearths which extend into the layer beneath. 0.1-0.5 cm.
(3) Yellowish-brown compact loam, filled (up to 70-80%) with sand, gravel, rubble, and a few larger pieces of limestone, plus numerous traces of human activity. 0.5-25 cm. Mousterian.
(4) Compact clay at the base, in pockets. 10-20 cm.

Liubin's observations on the stratigraphy (1989) were as follows.

(1) The layers are discordant, in that the Upper Palaeolithic is missing.
(2) There is a sharp contrast between Holocene layer 1 and Pleistocene layer 2.
(3) Mousterian layer 3 is in situ, sealed by layer 2.

(4) The crust constituting layer 2 is a lithological, biological, and cultural marker. It has an independent climatic significance, signifying a wet warm phase, succeeding a phase of active frost weathering in Mousterian layer 3.

(5) The Mousterian layer has a high proportion of anthropogenic elements. Although not thick, it contained >20,000 flints, about 80,000 bone fragments, many bone retouchers, traces of the use of fire, a large stone grinder which is assumed to have been used for pulverising haematite or limonite, and human remains (a child's mandible, and 10 isolated teeth).

The Mousterian layer was excavated by means of 3 or 4 thin artificial horizons (5-8 cm thick). The separation by horizons allowed the tracing of certain changes in the archaeological inventory and the natural environment over time.

2.5.3.2 Sedimentology

Chernyakhovskii (1994) made a distinction between autochthonous and allochthonous elements in the sediments. The former are composed not only of fallen blocks but also of microcrystalline calcite, which formed as a result of the partial dissolution of these blocks, followed by their recrystallisation. Allochthonous components include organic material (fragments of bone, phosphate, and phytoliths) and also grains of silicate and aluminosilicate which do not exist in the local limestone. Unlike the Holocene level, the Mousterian layer contained principally autochthonous components. Phytoliths have been found only at the bottom of the layer. This is regarded as an additional proof of the existence of hearths in this horizon. The Mousterian layer also shows signs of post-depositional movement.

The strongest post-depositional effects are detected in the crust layer (2). Its degree of cementation increased from the base upwards. The crust incorporated certain materials derived from the Mousterian layer beneath (limestone rubble, flint chips, fragments of bone).

2.5.3.3 Fauna in the Mousterian layer

Represented mainly by food debris. Many small fragments of large mammal bones; few remains of rodents, birds, and amphibians. According to Baryshnikov (1994, summarised in Liubin 1998) the composition of the finds (mainly long bones and extremities) indicates that the meaty parts of the carcases alone were brought into the cave. 23 mammal species, 7 species of birds, and a few bones of amphibians were identified.

Table 1 in Liubin (1998) gives a full list of the mammal species. The finds are divided by layer, but birds are not included. Numbers are given in terms of NISP/MNI.

Only 670 bones out of >80,000 (<1%) allowed a specific determination. Bison constituted the bulk of the finds (48.8% of all exploitable animals, 290/11). Baryshnikov believes (despite the figures quoted) that the real number of individuals present cannot have been less than 200. Other important ungulates included Capra (28.2% or 168/9), Ovis (78/7), Megaloceros (25/5), and Equus (8/4).

The species composition (Ochotona, Spermophilus, Cricetus, Equus, Megalocerus, Bison, Ovis) indicates a steppe environment, in an area which is now covered by beech woods. Alpine forms (Marmota, Chionomys spp.) are confined to the base of the Mousterian layer (horizons 2-4). The number of bones of Capra , which lives high in the mountains, is much higher here than that of Ovis, which is characteristic of the xerophytic foothills. The appearance in the upper part of the Mousterian layer (horizon 1) of the bones of Martes, Apodemus, Sus, and Cervus elaphus, together with the change in the relationship between Capra and Ovis, suggests the beginning of a process whereby the territory became more wooded.

The birds were determined by A.V. Panteleev (Table 3 in Baryshnikov, 1994; Table 2.5). Apart from unidentified bird bones and indeterminate Passeriformes, seven species were identified as follows. Anas crecca L/querquedula L, Columba livia L, Utlanocorypha sp., Lullula arborea L, Anthus trivialis L, Rhodopechys sanguinea Gould, Corvus corax L. The majority were found in horizon 2. Baryshnikov comments that these species are mainly indicative of open landscapes.

2.5.3.4 Palynology

The definitive account is given by G.M. Levkovskaya (1994) in the book edited by Liubin (1994) . Liubin himself summarised her conclusions twice (1989 and 1998). The second version follows Levkovskaya's published account closely, but the first version differs from it in some respects. Presumably it should now be regarded as superseded by the definitive published account. Levkovskaya summarised her results in a table and a figure, reproduced here with explanatory notes (1994, Table 2.6 and Figure 2.28).

She distinguished 7 vegetation types. Their occurrence allowed her to establish four pollen zones corresponding to Mousterian horizons 4, 3, 2 and 1, in layer (3), and the carbonate crust in layer (2). Zone V, corresponding to layer (1), produced too little material for analysis. Zone "0" represents present day conditions, and the material for it came not from the cave itself but from the floodplain of the river Gubs, 60 metres below. 17 samples were taken, but the results have been amalgamated into 10 sample locations. The % figures have been calculated with respect to AP, NAP, and spores taken together. No explanation is given as to how the "quantitative indicators" at the foot of Table 2.6 have been calculated. Levkovskaya provides a further commentary on the different pollen zones as follows. All figures are in percentages unless otherwise stated.

Pollen zone I (excavated horizon 4)

AP 42, NAP 22, spores 36. coniferous 15, deciduous 0. Exotics include Alnaster and Larix. Since Alnaster does not now exist in the Caucasus (in Europe it signifies an area with perpetual frost) and Betula spp. grow on the boundary of the wooded and sub-Alpine zones, there is an indication that this was a cold continental climate. Both the birch and the alder are dwarf forms. Levkovskaya estimates that the mean annual temperature in this area at that time may have been at least 3.5°C less than it is now.

Pollen zone II (excavated horizon 3)

AP 51, NAP 34, spores 15. coniferous 3.9, deciduous 6.5. Exotics as before. The deciduous species include Carpinus orientalis, and Levkovskaya draws attention to the fact that there are now three species in vegetation type VII which flourished on bare rock slopes. She characterises the environment as a whole as a relatively warm wooded steppe with some remnants of periglacial vegetation (including the dwarf forms) still persisting.

Pollen zone III (excavation horizons 2-1)

AP 56, NAP 30, spores 14. deciduous 21, particularly Corylus, Ulmus, and Carpinus. No more dwarf forms, but exotics include Ostrya and Castanea. Levkovskaya considers that the water plant Osmunda probably got into the site as a result of human activity. In general, she characterises this zone as representative of a warm wooded steppe, with a mixture of mid mountain type deciduous trees and vegetation characteristic of open areas. III is warmer than II.

Pollen zone IV (carbonate crust)

AP 50.7, NAP 39.7, spores 9.6. deciduous 32, particularly Juglans and Carpinus orientalis. The environment as a whole is characterised as a warm wooded steppe, with low mountain type trees and a relatively large percentage of exotics. For Levkovskaya, this layer represents an optimum warm stage. Belyaeva (1999), relying on Levkovskaya, suggests that the layer corresponds to a warm interstadial within the last glaciation, comparable to some extent with the two warm phases established at Monasheskaya, in layer 3A horizon 3 and the base of layer 4.

Pollen zone V (layer 1)

Although 5 samples were taken, the quantity of material present was minimal. The pollen grains may have been burnt.

Pollen zone “0” (Gubs valley)

Deciduous AP 65. These days there are >30 species of trees in the area, with some relict elements, but very few coniferous.

In general, Levkovskaya emphasises how varied the pollen record is in the Mousterian horizons at the cave, notwithstanding the fact that they were so thin and compact.

2.5.3.5 Archaeology

A workshop plus a habitation site. Raw material, 98-99% local grey/black flint of poor quality, a small amount of better yellow/brown flint that was brought into the cave from outside the canyon. Only 60 cores, but all stages of secondary working are represented. 150 bone and stone retouchers, a large number of small flakes. Basically disc cores. Small sized industry, average 5-6 cm max length. Dechets de travail 89.9%, tools 4.8%, utilised flakes 5.3%. Basic categories of tools (n=795: a full list is given in Table 4 of Liubin 1998): points 29, sidescrapers 277, notches 223, denticulates 52. In general, a Typical Micromousterian, with high IR=34.8 and index of notches=30.65. Decline in relative abundance of notches from base upwards, but the industry throughout is broadly homogeneous. A few bifacially worked pieces. Presumably this has inspired a comparison also to the East European Micoquian. Similarities to Monasheskaya support the idea that there was a 'local cultural tradition'. One of the characteristics of this tradition is the use of ventral thinning as applied to certain tools. The Mousterian of the Transcaucasus is different.

2.5.3.6 Anthropological finds

Determinations by A.A. Zubov, G.P. Romanova, V.M. Kharitonov (1994). 10 teeth have been found in Mousterian horizons 1, 3, and 4. In addition, in 1979, at the base of the Mousterian layer, 2-3 cm from the cave floor, in horizon 2, was found a child's mandible with a full set of milk teeth. The child was 2-3 years old. On the basis of a comparison to Teshik-Tash and Zaskal'naya VI it was determined that this was an individual belonging to the Neanderthal stage "or at least" to a stage transitional between Neanderthal and anatomically modern man (Zubov et al., 1994: 90).

2.5.3.7 Palaeogeography and chronology

The first settlement of the cave took place in a dry and cold climate, to judge by the characteristics of the base of the Mousterian layer, i.e., presence of exfoliated rubble, predominance of open steppe animals, and pollen indicative of sub-Alpine vegetation. The vegetation zones of the northern slopes of the Western Caucasus at that time were 1000 metres lower than at present. The joint presence of Alpine species (Marmota, Chionomys, Capra) and those characteristic of the steppes below the Caucasus (Equus, Ellobius, Cricetus) allow us to reconstruct the evolution of the landscape. The wooded zone was divided into separate islands, and the Alpine meadows directly joined the steppes, which penetrated deep into the mountains.

In the upper part of the Mousterian layer there are indications of an improved climate. In horizons 1 and 2 there are a few remains of such wooded mountain species as Martes and Cervus elaphus, and in horizon 1 Sus scrofa and Apodemus. At the time of the formation of horizon 2, judging by the pollen, the cave corresponded to the upper part of the wooded zone. These are indications of the onset of a warm climatic episode. In Liubin's opinion, this may perhaps correspond to Brorup, as shown by lithology (a phosphate crust) and by pollen (deciduous trees in the sample corresponding to that layer). The relatively "archaic" nature of the Mousterian industry is said not to be in contradiction with this. The accumulation of the Mousterian layer, which is not very thick, proceeded very slowly, judging by the appreciable evolution of the stone industry which occurred, and the bio-stratigraphic changes which took place over that time.

First version 27 June 2004; revised 9 August 2005.

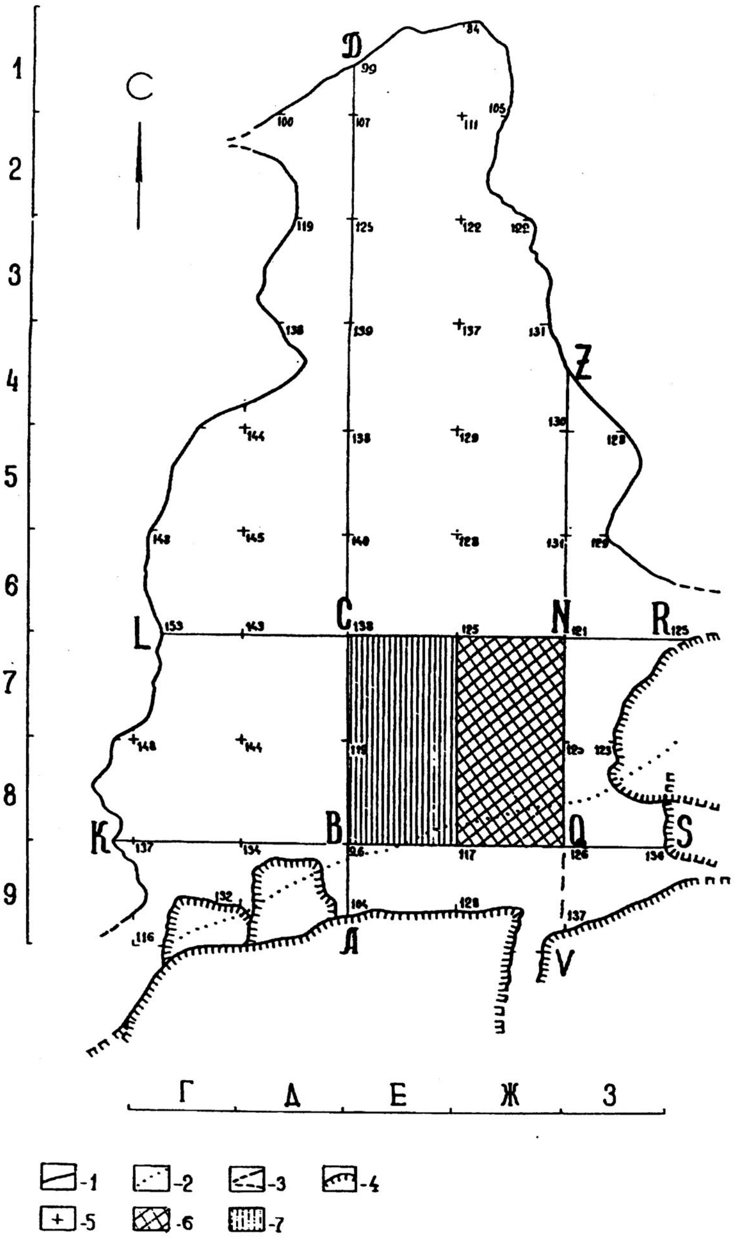


Рис. 72. Баракаевская пещера. План:
1 — стена пещеры; *2* — капельная линия; *3* — карстовый канал; *4* — глыбы обвала; *5* — квадратная сеть; *6* — раскоп-шурф 1977; *7* — шурф 1976 (по: [Любин, 1994б])

Fig. 72. Barakaevskaya Cave. Plan:
1 — cave wall; *2* — drip line; *3* — karstic channel; *4* — fallen blocks; *5* — grid system; *6* — 1977 test excavation; *7* — 1976 test excavation (after: [Любин, 1994б])

Figure 2.25. Barakaevskaya, site plan

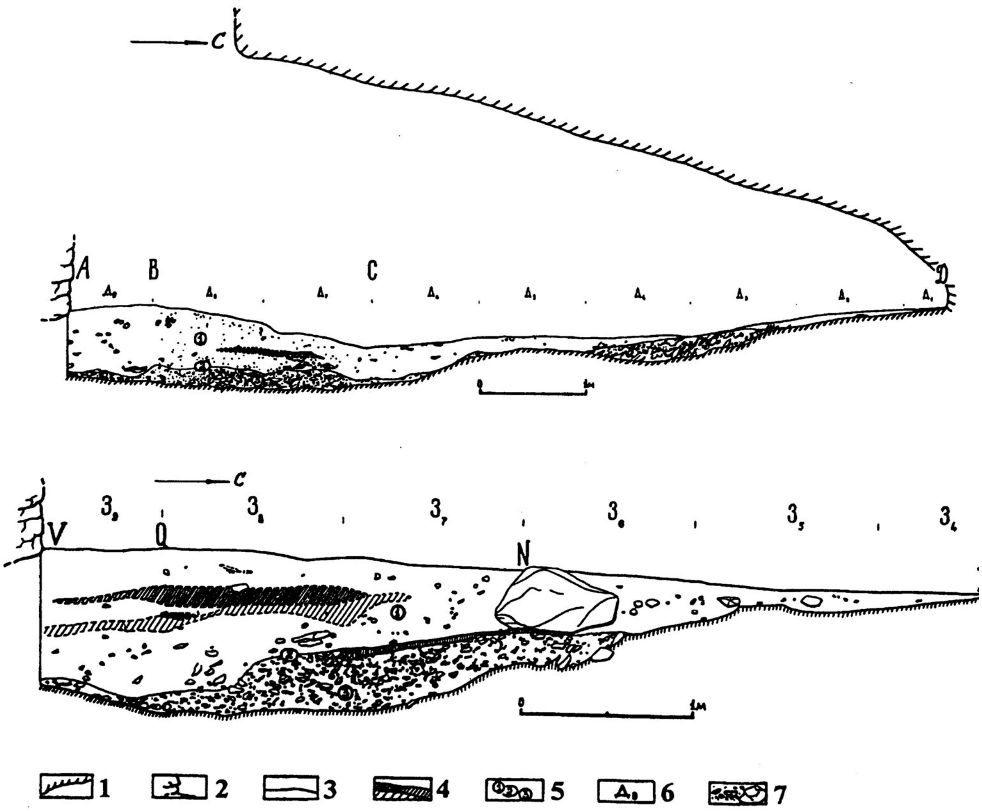


Рис. 73. Баракаевская пещера. Разрезы:

1 — скала; *2* — край обвальной глыбы; *3* — дневная поверхность пола до начала раскопок; *4* — углистые и зольные прослойки в сло
5 — номера слоев; *6* — квадраты; *7* — щебень (по: [Любин, 1994б])

Fig. 73. Barakaevskaya Cave. Cross-sections:

1 — rock wall; *2* — fallen block; *3* — present ground floor before start of the excavation; *4* — charcoal and ashy interlayers within the layer 1; .
numbers of the layers; *6* — grid squares; *7* — limestone rubble (after: [Любин, 1994б])

Figure 2.26. Barakaevskaya, sections A – D and V- Z

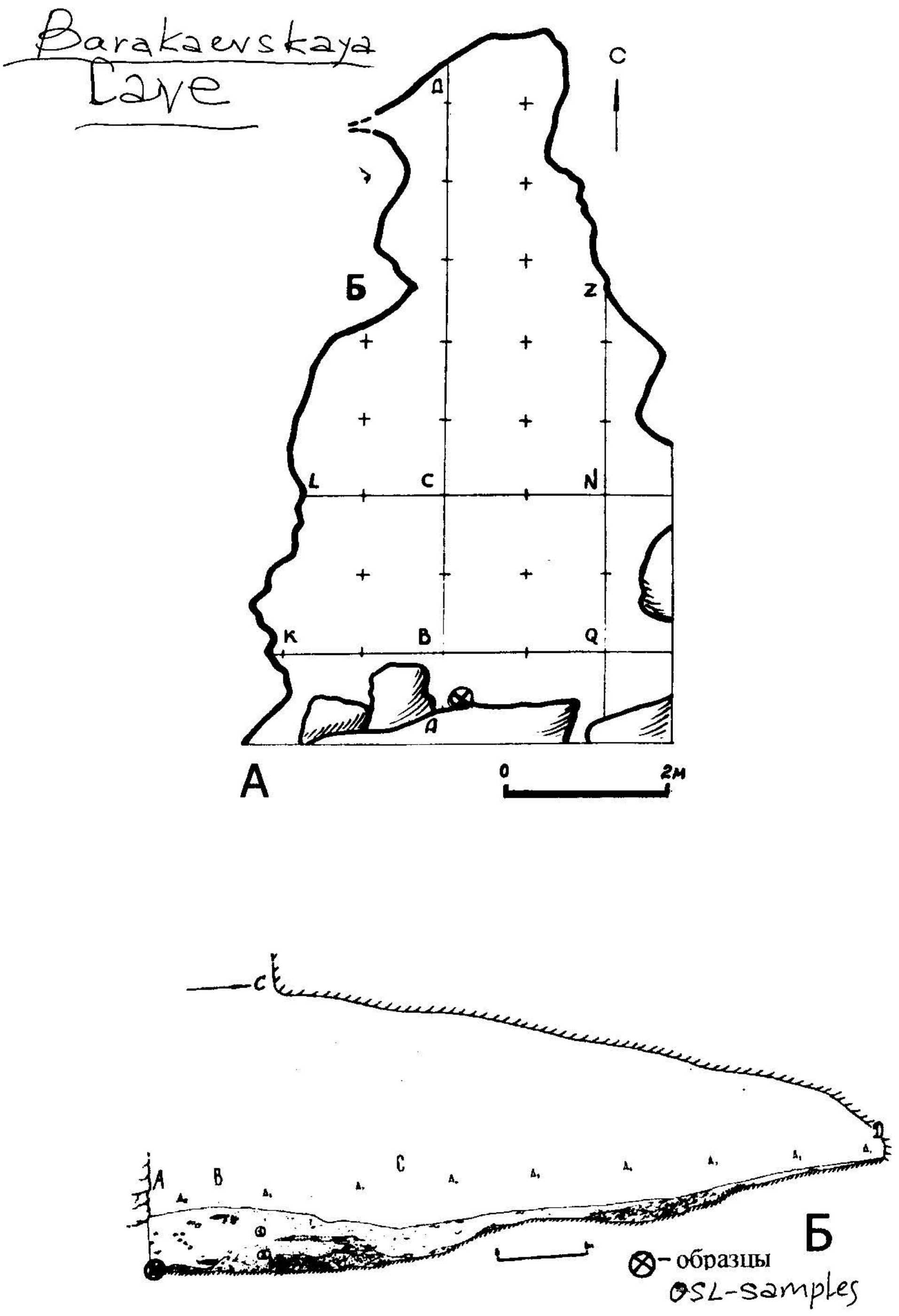


Рис. 11. Баракаевская пещера. А – План пещеры с указанием точки, откуда брались образцы; Б – Разрез А – Д с указанием точки взятия образца

Figure 2.27. Barakaevskaya, 2004 section with position of the OSL sample

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Tabl. 1. — Les mammifères et leur répartition quantitative dans les 4 horizons moustériens.

Table 1. — *The mammals and their quantitative distribution within the 4 Mousterian layers.*

Espèces	*Niveau moustérien*					*Total*
	1	*2*	*3*	*4*	*non préconisé*	
Lepus europaeus Pall.	1	1	–	–	–	2/2
Ochotona pusilla liubini	2/2	–	1	–	–	3/3
Marmota paleocaucasica Barychn.	–	–	–	1	–	1
Spermophilus cf. *musicus* Menet	1	2/1	–	–	–	3/2
Apodemus sylvaticus L.	2/1	–	–	–	–	2/1
Ellobius talpinus Pall.	–	–	1	–	–	1
Cricetus cricetus L.	–	4/1	–	–	–	4/1
Arvicola chosaricus Alex.	1	8/2	2/1	–	–	11/4
Chionomys nivalis Martins	–	1	2/2	–	–	3/3
Chionomys gud. Satun.	–	–	1	–	–	1
Chionomys sp.	–	2	1	–	–	3
Microtus arvalis L. s. l.	14/4	9/4	7/4	1	–	32/13
Arvicolinae indet.	2/1	–	–	–	–	2/1
Canis lupus L.	2/1	–	–	–	–	2/1
Vulpes vulpes L.	–	3/1	2/1	–	–	5/2
Martes foina Erxl.	1	1	–	–	–	2/2
Crocuta spelaea Goldf.	1	2/2	2/1	–	–	5/4
Equus ferus Boddaert s;l;	3/2	3/1	2/1	–	–	8/4
Sus scrofa L.	2/1	–	–	–	–	2/1
Cervus elaphus L.	2/1	3/1	–	–	–	5/2
Megaloceros giganteus Blum.	5/1	7/1	1	–	11/1	25/5
Bison priscus Boj.	52/3	72/2	99/4	62/1	2/1	290/11
Rupicapra rupicapra L.	1	–	–	–	–	1
Capra caucasica Guld et Pall	16/2	43/2	68/3	37/2	4/1	168/9
Ovis orientalis Gmel.	32/2	19/2	21/2	6/1	–	78/7
Esquilles osseuses non identifiées principalement de bison	17 262	27 058	22 893	11 570	2	78 812

Table 2.5. Barakayevskaya: the mammals and their quantitative distribution within the four Mousterian Layers.

Тип растительности	Флора	Раскопочные горизонты 4	3	2-1	На тек	Поверхн. проба
1	2	3	4	5	6	7
I Граница лесного и субальпийского поясов	Alnaster	+	+	-	-	
	Betula humilis	+	+	-	-	
	Betula sect. Albae	-	+	+	-	+
	Larix	+	+	-	-	
	Pinus (карликовые формы)	-	+	-	-	
	Botrychium	+	-	-	-	
II Верхнегорные хвойные леса	Abies nordmanniana	-	-	-	-	+
	Picea orientalis	-	-	-	+	
	Pinus sylvestris	+	+	+	-	+
	Juniperus	+	-	+	-	
	Arctostaphylos	-	-	-	+	
	Selaginella selaginoides	-	-	+	-	
III Широколист-венные леса	Acer	-	-	+	-	
	Carpinus betulus	-	-	+	+	+
	Fagus sylvatica	-	-	+	-	
	Fraxinus excelsior	-	-	+	-	+
	Malaceae	-	-	+	-	+
	Quercus	-	+	-	-	+
	Tilia pltyphyllos	-	-	-	+	
	Ulmus	-	-	+	+	
	Corylus	+	+	+	+	+
IV Преимущест-венно низко-горные леса	Carpinis orientalis	-	+	+	+	
V Реликтовые лесные ценозы	Buxus	-	+	-	+	
	Castanea	-	-	+	-	
	Juglans regia	-	-	-	+	
	Ostrya carpinifolia	-	-	+	+	
VI Степи	Plantago stepposa	-	-	+	+	+
VII Ценозы руде-ральные или незадерно-ванных склонов	Artemisia	+	-	+	+	-
	Amaranthus	-	+	-	-	-
	Brassicaceae	-	-	+	+	-
	Chenopodiaceae	-	-	+	+	+
	Ephedra	-	-	-	+	
	Fagopyrum	-	+	-	+	
	Helianthemum	-	-	+	-	
	Polygonum aviculare	-	-	+	-	
	Plantago	-	+	+	-	
VIII Водная	Osmunda	-	-	+	-	

Выводы к таблице 5

	Тип растительности	Количество в горизонте				Поверхн. проба
Количественное распределение индикаторов различных типов по горизонтам	I	4	5	1	-	1
	II	2	1	3	2	2
	III	1	2	7	4	5
	IV	-	1	1	1	-
	V	-	1	2	3	-
	VI	-	-	1	1	-
	VII	1	3	6	3	1
	VIII	-	-	1	-	-
Палинозоны		I	II	III	IV	0

Table 2.6. Geographical analysis of the fossil flora from the Mousterian layer at Barakaevskaya and the overlying carbonate crust (Levkovskaya 1994, table 5)

Explanatory Note

The columns are labelled 1-7 as follows. 1 vegetation type, 2 flora, 3-4-5 excavation horizons 4, 3, 2-1, 6 carbonate crust, 7 surface sample.
Vegetation types I-VIII are listed on the left hand side as follows.

I Boundary of the wooded and sub-Alpine belts
II High mountain coniferous woods
III Deciduous woods
IV Mainly low mountain woods
V Relict woods
VI Steppes
VII Rocky slopes
VIII Water

The table at the bottom reads: Conclusions from Table 5.
It shows the “quantitative representation of the indicators of different vegetation types according to the various horizons”.
The vegetation types I-VIII are as before. The horizons are also arranged in columns as before. The pollen zones I-IV and 0 are listed at the bottom.

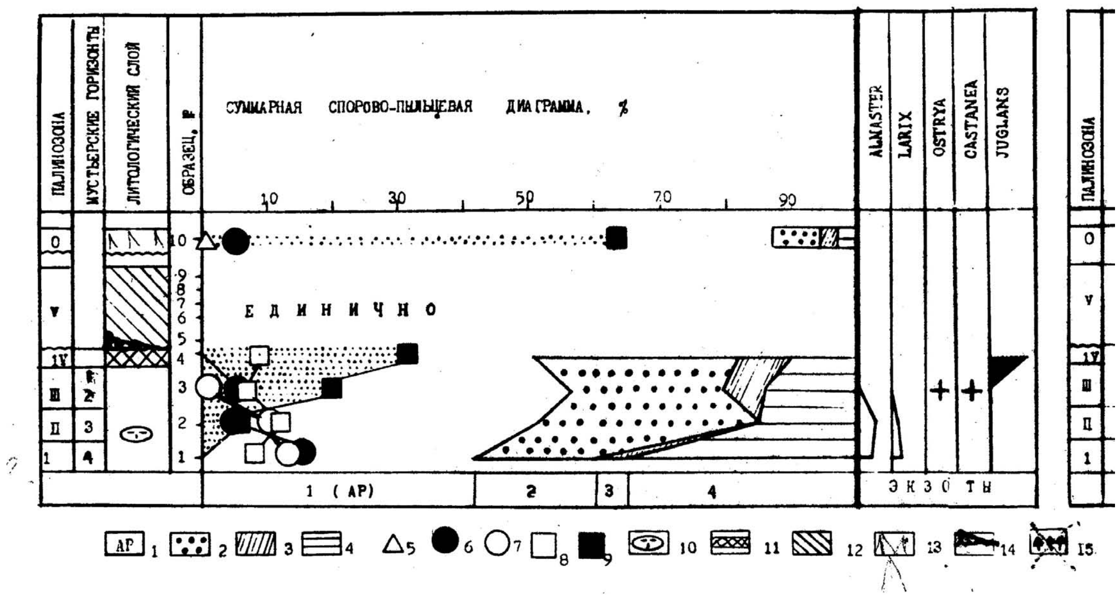

Figure 2.28. Pollen and spores diagram of the Mousterian deposits at Barakaevskaya (Fig. 20 Levkovskaya 1994) [NB only the most significant components of the complete diagram are shown]

Explanatory Note

The headings at the top read (from left to right) as follows
Pollen zones/ Mousterian horizons/ lithological layers/ sample numbers/ summary diagram %s/ exotic plant names 1-5/ pollen zones. The pollen zones are named as follows (according to vegetation type)

- 0 present day, low mountain type woods
- V -
- IV wooded steppe, low mountain type woods (and exotics)
- III wooded steppe, mid mountain type woods
- II wooded steppe, mixed cold and warm indicators
- I boundary of wooded and sub-Alpine belts

The Key is labelled as follows:

1 AP, 2 NAP mesophil and mesoxerophil, 3 NAP xerophil, 4 spores, 5 spruce, 6 pine, 7 birch, 8 alder, 9 AP deciduous, 10 Neanderthal mandible, 11 phosphate-carbonate crust, 12 ashy Holocene deposits, 13 surface sample from present day alluvial floodplain of river Gubs (60 m below the cave), 14 Final Upper Palaeolithic artefacts found in places between the crust and the Holocene deposits, [15 apparently a mistake].

2 DSR Gubs Gorge

Appendix 2.1 Pre-sampling site assessment forms (by Burbidge & Allsworth-Jones)

Site	Monasheskaya Cave

General Description

Gubs Canyon, large cave, good sections in open areas but behind drip line. Good info from Belyaeva’s thesis.

Geographic Description

Gubs facing South. Rockshelter with “gullies” at back.
- Gubs, Barakaevskaya and Monasheskaya in line along valley.

Latitude		**Longtitude**		**Altitude**	

Bedrock Geology

Limestone

Archaeology & Quaternary Stratigraphy:

Excavation History

1961-1964 Autlev and Liubin – Initial small pit
1975-1976 Liubin – Larger area
1987-1988, 1990-1991 Belyaeva – Two small areas

Periods/cultures represented

Mousterian – severe truncation
Medieval /Post Med.

Main activities represented

Occupation – in particular layer 3a
Neanderthal burial – layer 2.

Common artefact types	e.g. Flint, quartzite, hearths/occupation, faunal, human etc.

Human (1 skeleton in 2a).
Faunal bone common but in poor condition.
Flint of two types.
Hearths and Ash in 3A and 2 (No ^{14}C)

Faunal remains

Much but bad condition. One Marmot skeleton from burrow – many burrows in sections, but they seem well defined.

Sedimentation types	e.g. Aeolian, fluvial, colluvial, anthropogenic, loessic, sandy

Eluvial at base
Rockfall (layer 3Б in particular)
Colluvial beyond drip-line, and inside cave too?- *cf*. differences in pollen between layer 4 in square 7 and layer 4 in section У-Г.

Approx. depth of stratigraphy	Variable: 1.5 – 0.5 m

2 DSR Gubs Gorge

Approx. No. contexts / stratigraphic units	5 + subdivisions
Expected age range	?~50 ka? OIS3 Truncated Palaeolithic – no transition to Upper Palaeolithic
Existing chronological control e.g. Typology, Anthropology, Faunal, ^{14}C etc	
Pollen phases indicate OIS3 Typology. Bad ^{14}C of ~ 15ka from ???? (collagen hard to extract) Ash where from?… might not be so bad.	
Artefacts/contexts of particular note	
Neanderthal skeleton in layer 2, square 7. Gubs culture layers – 3a in particular, but throughout.	
Archaeological questions to be addressed	
Really chronology – how it fits in. Impacts on Barakaevskaya and Monasheskaya. Skeletal remains here and at Barakaevskaya.	
Chronological questions to be addressed	
Age of Neanderthal skeleton in layer 2, square 7. Gap / Hiatus between 3Б rockfall and 3A? Is layer 4 representative of a warm to cold transition? Correlation of layer 4 in square 7 with layer 4 in section У-Г. 3a is the main cultural horizon – date it. Absolute chronology for pollen record.	
Regional connections	
Gubs, Barakaevskaya and Monasheskaya in line along valley – “Gubs Culture”. Pollen Pt connection with Monasheskaya claimed – where? Check. Well-dated Neanderthal skeletal remains in Mezmaiskaya – not going there, but find age for comparison.	
Importance of the site archaeologically	
Neanderthal remains in 2a. Dense occupation/artefacts in 3a (and 3A in general) Implications for definition of Gubs Culture	
Importance of the site in terms of the regional chronology	
Barakaevskaya, Gubs Rockshelter, and Monasheskaya should contain the same archaeological records. Pollen record – but needs some sorting out. Good Middle Palaeolithic sequence through various climatic stages, but truncated. BUT: Use as a base for Barakaevskaya and Gubs Rockshelter, or concentrate on those.	
Datability of the site	
Many burrows, including of Holocene age, but well defined and archaeology is “in	

situ”. Sandy layers, but from what source? Heated sediment – hearths/ash. ⇒ Possible but much care required. - Will square 7 near the skeleton be opened?		
Contexts on which to focus for sampling		
Layer 4: Upper/lower?? Cold/warm?? Square 7 vs. section У-Г. Provides oldest age for sequence. Possible break between 3Б rockfall and 3А would be difficult Layer 3a: Cultural layer and last 3rd optimum warm spell. Heated material? Layer 2: Skeletal remains in square seven. Archaeologically important.		
Completed By	**Checked By**	**Date**
CIB		

Site	Gubs Rockshelter No. 1				
General Description					
Rock shelter, 90-100 m above river. Wide and shallow.					
Geographic Description					
Gubs facing South-south-east in limestone cliffs. Sheltered from wind. - Gubs, Barakaevskaya and Monasheskaya in line along valley.					
Latitude		**Longtitude**		**Altitude**	
Bedrock Geology					
Limestone					
Archaeology & Quaternary Stratigraphy:					
Excavation History					
7 m trench excavated 40 years ago. Liubin and Muratov (geologist).					
Periods/cultures represented					
Superposed Mid and Upper Palaeolithic					
Main activities represented					
Occupation + some working of flint. Layer 3 = ash/humified, Layer 4 = burnt…what was happening on the site in these periods?					
Common artefact types	e.g. Flint, quartzite, hearths/occupation, faunal, human etc.				
Flint (local sources). No mention of burnt Middle Palaeolithic flints. Hearths/occupation layer: Layer 3 (Upper Palaeolithic)					
Faunal remains					
Very little but not all reported. Palynology indicates climate in Middle Palaeolithic Layers 5 to 7					
Sedimentation types	e.g. Aeolian, fluvial, colluvial, anthropogenic, loessic, sandy				
Exfoliation / rockfall. Anthropogenic. Aeolian – clean lenses in Layer 2, and suggested component of other layers					
Approx. depth of stratigraphy	1.75 m				
Approx. No. contexts / stratigraphic units	8				
Expected age range	OIS3-Holocene. Climate, top links with Monasheskaya End of OIS3 - Levkovskaya				
Existing chronological control e.g. Typology, Anthropology, Faunal, ^{14}C etc					
Typology, Pollen, Climate. – Links to Monasheskaya					

Artefacts/contexts of particular note		
Layers 3 and 4. Upper Palaeolithic Anthropogenic (Layer 3 = ashy/humic … naturally developed soil? Layer 4 = burnt)		
Archaeological questions to be addressed		
What do (Upper Palaeolithic) Layers 3 and 4 represent?		
Chronological questions to be addressed		
Constrain Upper Palaeolithic – Middle Palaeolithic boundary, and indicate length of potential hiatus/erosion. How far back does site usage go?		
Regional connections		
Assemblages: Gubs, Barakaevskaya and Monasheskaya in line along valley – “Gubs Culture”. Climatic and supposed chronological link to Monasheskaya. Upper Palaeolithic: don’t know.		
Importance of the site archaeologically		
Upper Palaeolithic and Middle Palaeolithic superposed IN CAVE.		
Importance of the site in terms of the regional chronology		
Implications for “Gubs Culture” in general. Type site with Monasheskaya.		
Datability of the site		
Middle Palaeolithic: Coarser material at top of Layers 5 and 7, Layer 6 has less rubble. Rockfall seals layers near rim. Layers 3 and 4 may be cleaner and date better – Anthropogenic, but Upper Palaeolithic. Test Limestone for contamination.		
Contexts on which to focus for sampling		
Layers 3 and 4 – There is archaeological interest and they should be datable. Look for lenses in Layers 5, 6, and 7. Plenty of Aeolian derived sediment (apparently), but contamination issues.		
Completed By	**Checked By**	**Date**
CIB		

Site	Barakaevskaya Cave				
General Description					
Gubs Canyon, Karst cave, Northern Caucasus. Cave sediments virtually dug out.					
Geographic Description					
Foothills of Skalisty Ridge. Mostov Region. 73 m above valley. South facing					
Latitude		**Longtitude**		**Altitude**	
Bedrock Geology					
Limestone					
Archaeology & Quaternary Stratigraphy:					
Excavation History					
1976 – 1981 Liubin and Autlev					
Periods/cultures represented					
Middle Palaeolithic and later (Neolithic – Mediaeval)					
Main activities represented					
Middle Palaeolithic : Occupation (long term), Butchery, Tool manufacture.					
Common artefact types	e.g. Flint, quartzite, hearths/occupation, faunal, human etc.				
Flint, bone, hearths at base, Human: Mandible + teeth (skull?) at very base					
Faunal remains					
Bison, not Cave Bear: implies plains hunters					
Sedimentation types	e.g. Aeolian, fluvial, colluvial, anthropogenic, loessic, sandy				
Autochthonous material – roof spall and bits and bobs Allochthonous material – mainly faunal / human BUT – mention of sand and gravel, plus hearths at base (i.e. anthropogenic)					
Approx. depth of stratigraphy	0.85 m				
Approx. No. contexts / stratigraphic units	4				
Expected age range	Brorup (> 50 – 60 ka, but speculative) + Holocene				
Existing chronological control e.g. Typology, Anthropology, Faunal, ^{14}C etc					
Typology + Anthropology + Stratigraphy indicates Middle Palaeolithic, but speculative					
Artefacts/contexts of particular note					
Layer 3:					

Human mandible and teeth at base of Layer 3 (Middle Palaeolithic), base of sediments. Lots of tools throughout Layer 3. Lots of hearths at base of Layer 3.		
Archaeological questions to be addressed		
Part of Gubs group – Linking assemblage to Gubs and Monasheskaya		
Chronological questions to be addressed		
Age of mandible – Neanderthal. Length of time represented by Layer 3, and climate at different times through Layer 3, but Layer 3 is thin… Layer 2 carbonate crust: age to constrain hiatus in Layer 3 (also = warm spell).		
Regional connections		
Cold – warm as other sites. Linkages within Gubs group.		
Importance of the site archaeologically		
Neanderthal remains. Lots of tools. Climate variation during later Middle Palaeolithic.		
Importance of the site in terms of the regional chronology		
Links to Gubs Rockshelter and Monasheskaya – tie in with human remains.		
Datability of the site		
Hearths? OK. Thin Middle Palaeolithic layer remains: Sediments may not be representative of archaeological sequence identified where layer was deeper, however they do apparently contain sand. The major issue is the continued existence of the section – the most interesting material may have been completely excavated.		
Contexts on which to focus for sampling		
Layer 3, in particular the base.		
Completed By	**Checked By**	**Date**
CIB		

Appendix 2.2 Luminescence sample forms

Site Code: **Site Name:** Monasheskaya	**Date** 4/7/04	**Context No** Section У-Г Layer 3A-1	**Luminescence Sample No** EFD4L001

Description of sampling location:	**Sketch of surrounding area**
Tube sample, middle of Layer 3A-1: 32 cm from base of Layer XB [[[or base of rubble layer]]], 80 cm from left hand end of section (~У). Section У-Г runs S-N perpendicular to canyon wall, from 0 – 2 m up slope of drip line & hence avoids colluvial sediments. ~10 cm thick yellowish brown. 10 cm beneath rubble rich layer, 20 cm above occupation layer (3a). Sealed locally by Layer X, which contains evidence for possible water logging and possible volcanic ash. Stratigraphically underlies Layer 2 containing skeletal remains. Seals Layer 3a (3A-5): Dark occupation layer containing charred material and artefacts.	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G004	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = 13 cm
Est. Solid Angle = 3.8-3.9 π
Gamma dose rate = 0.142 ± 0.004
Limestone clast sample taken adjacent to gamma spec hole after measurement:
EFD4L001 Limestone

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Layer 3A-1 = Top of Mousterian sequence in section У-Г - constrain
Series of climatic oscillations through Layer 3, indicated by pollen. - constrain
Should predate EFD4L006, and post-date EFD4L002 etc.

Completed By	**Checked By**	**Date**
CIB		

Site Code: **Site Name:** Monasheskaya	**Date** 4/7/04	**Context No** Section У-Г Layer 3a	**Luminescence Sample No** EFD4L002

Description of sampling location:	**Sketch of surrounding area**
Tube sample, middle of Layer 3a (3A-5): 62 cm from base of Layer XB [[[or base of rubble layer]]], 80 cm from left hand end of section (~У). Section У-Г runs S-N perpendicular to canyon wall, from 0 – 2 m up slope of drip line & hence avoids colluvial sediments. 5 – 15 cm thick dark occupation layer – lots of bone & charred material, ⇒ heated component to sediments Sealed by 3A(upper) Seals 3A(lower)	
	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G005	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = 13 cm
Est. Solid Angle = 3.8-4 π
Gamma dose rate = 0.185 ± 0.01
Note: ~10 cm limestone stone found in γ-spec hole
Limestone clast sample taken adjacent to gamma spec hole after measurement:
EFD4L002 Limestone

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Layer 3a contains clearest (and most significant? – also see EFD4L004 & 5) occupation evidence ⇒ obtain direct date.
Fits into series of climatic oscillations through Layer 3 ⇒ climatic chronostratigraphy.
Should pre-date EFD4L001 and post-date EFD4L003 etc.

Completed By	**Checked By**	**Date**
CIB		

Site Code: Site Name: Monasheskaya	Date 4/7/04	Context No Section У-Г Layer 3А-6	Luminescence Sample No EFD4L003

Description of sampling location:	**Sketch of surrounding area**
Tube sample from Layer 3A-6, in Layer 3A mid-way between 3a and 3Б: 80 cm from base of Layer XB [[[or base of rubble layer]]], 8 cm below base of Layer 3a (3A-5). ~80 cm from left hand end of section (~У). Section У-Г runs S-N perpendicular to canyon wall, from 0 – 2 m up slope of drip line & hence avoids colluvial sediments. ~25 cm thick layer of yellowish sediment containing limestone gravel and lenses of artefacts and humic material ⇒ some occupation. Sealed by 3a (3A-5): Dark occupation layer containing charred material and artefacts. Seals 3Б: Rubble rich layer	 Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G006	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = 13 cm
Est. Solid Angle = 3.8-4 π
Gamma dose rate = 0.263 ± 0.01
Limestone clast sample taken adjacent to gamma spec hole after measurement:
EFD4L003 Limestone

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Mousterian warm phase? Above humic horizon associated with artefact concentration (phase of occupation within 3A lower).
Should pre-date EFD4L002 and post-date EFD4L004 etc.

Completed By	Checked By	Date
CIB		

<table>
<tr><td>Site Code:
Site Name:
Monasheskaya</td><td>Date

4/7/04</td><td>Context No
Section У-Г
Layer 4 (upper)</td><td>Luminescence Sample No
EFD4L004</td></tr>
</table>

Description of sampling location:

Tube sample from upper part of Layer 4: 135 cm from base of Layer XB [[[or base of rubble layer]]], ~80 cm from left hand end of section (~У).
Section У-Г runs S-N perpendicular to canyon wall, from 0 – 2 m up slope of drip line & hence avoids colluvial sediments.
Mousterian artefact rich layer.
Sealed by 3Б: Rubble rich layer
Seals Bedrock.

Sketch of surrounding area

Photo No:

Gamma Dosimetry	Reading	Assoc. Sample	Ref No
	EFD4G007	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = 13 cm
Est. Solid Angle = 3.8-4 π
Gamma dose rate = 0.23 ± 0.01
Limestone clast sample taken adjacent to gamma spec hole after measurement: EFD4L004 Limestone

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Resolve pollen and hence climate associated with layer into chronology. Is there a short or long interval between top and bottom of Layer 4? And see EFD4L007.
Should pre-date EFD4L003 and post-date EFD4L005. May post-date EFD4L007 from mid Layer 4 in section Д-Ф.

Completed By	Checked By	Date
CIB		

Site Code: Site Name: Monasheskaya	Date 4/7/04	Context No Section У-Г Layer 4 (lower)	Luminescence Sample No EFD4L005

Description of sampling location:	Sketch of surrounding area
Tube sample from lower part of Layer 4: 144 cm from base of Layer XB [[[or base of rubble layer]]], ~80 cm from left hand end of section (~У). Section У-Г runs S-N perpendicular to canyon wall, from 0 – 2 m up slope of drip line & hence avoids colluvial sediments. Mousterian artefact rich layer. Sealed by 3Б: Rubble rich layer Seals Bedrock.	 Photo No:

Gamma Dosimetry	Reading	Assoc. Sample	Ref No
	EFD4G008	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = 13 cm
Est. Solid Angle = 4 π but close to bedrock below
Gamma dose rate = 0.218 ± 0.01
Limestone clast sample taken adjacent to gamma spec hole after measurement:
EFD4L005 Limestone

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Lowermost sample from site: constrain archaeological sequence. Resolve pollen and hence climate associated with layer into chronology. Is there a short or long interval between top and bottom of Layer 4? And see EFD4L007.
Should pre-date EFD4L004, and EFD4L007 from mid Layer 4 in section Д-Ф.

Completed By	Checked By	Date
CIB		

Site Code: **Site Name:** Monasheskaya	**Date** 4/7/04	**Context No** Section Д-Ф Layer 2	**Luminescence Sample No** EFD4L006

Description of sampling location:	**Sketch of surrounding area**
Tube sample from Layer 2: 86 cm above the level of eluvium/bedrock at point Ф, 22 cm horizontally S of Ф. Section Д-Ф runs S-N perpendicular to canyon wall, from 2 – 5 m up slope of drip line. Yellowish fine sediment with limestone, associated with skeletal remains, not present in section У-Г. Holocene age burrows common (fill as Layer 1), but avoided by sample tube. Sealed by Layer 1: Humic, grey, Holocene material. Seals 3A: Yellowish fine sediment with limestone, present in section У-Г.	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G009	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = 18 cm
Est. Solid Angle = 4 π
Gamma dose rate = 0.300 ± 0.007
Limestone clast sample taken adjacent to gamma spec hole after measurement:
EFD4L006 Limestone

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Youngest Middle Palaeolithic deposits on site, associated with Neanderthal remains excavated from Layer 2 in square 8(?), ~ 1.5 m from sampling position.
Clear evidence of bioturbation, plus reported post-depositional disturbance by people.
Should post-date EFD4L001 etc from section У-Г, but Neanderthal implies older than ~30ka.

Completed By	**Checked By**	**Date**
CIB		

Site Code: **Site Name:** Monasheskaya	**Date** 4/7/04	**Context No** Section Д-Ф Layer 4	**Luminescence Sample No** EFD4L007

Description of sampling location:	**Sketch of surrounding area**
Tube sample from middle of Layer 4: 13 cm below Layer 3Б and 12 cm above bedrock/eluvium at point of sampling, 48 cm horizontally N of Д. Section Д-Ф runs S-N perpendicular to canyon wall, from 2 – 5 m up slope of drip line. Mousterian artefact rich layer. Sealed by Layer 3Б: Rubble rich layer Seals 3A: Seals Bedrock / Eluvium	
	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G010	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = 13 cm
Est. Solid Angle = 3.8 - 4 π
Gamma dose rate = 0.229 ± 0.01
Limestone clast sample taken adjacent to gamma spec hole after measurement:
EFD4L007 Limestone

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Pollen from Layer 4 in section Д-Ф appears warm-cold-warm moving up from bedrock (so EFD4L007 should date a cold phase), but in section У-Г the climate appears coldish but marshy at first, then cold & damp above (EFD4L004 and EFD4L005 respectively).
Differences in pollen between sections question correlation of Layer 4 in each section:
Test chronological consistency: Should pre-date EFD4L004 and post-date EFD4L005 from section У-Г.

Completed By	**Checked By**	**Date**
CIB		

Site Code: **Site Name:** Gubs Rockshelter I	**Date** 5/7/04	**Context No** South wall of Amirkhanov's excavation (Square 3) Layer 2 (upper)	**Luminescence Sample No** EFD4L008

Description of sampling location:	**Sketch of surrounding area**
Tube sample from Layer 2 above humic horizon (layer 3), rubble and burnt material (layer 4). 27 cm below local datum at –1.6 m, 46 cm left from plumb line at RHS of section. Layer 2: Upper Palaeolithic, yellow-brown with limestone gravel. Sealed by Layer 1: Present topsoil. Contains Layers 3 (humic layer: similar texture to 2, but darker) and 4 (reddish clayey layer = burning). Some limestone rubble between levels of 3 and 4. Seals Layer 5: limestone stone fall layer above sediment similar to Layer 2 The section runs ~parallel to the canyon wall, around ~2m from the rock face. In general less limestone and more fines than at Monasheskaya. Short transport colluvial sediments from around the corner?	 Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G011	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4 π
Gamma dose rate = 0.167 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Indicate part of the time range of Upper Palaeolithic activity at the Gubs site. Should post-date all samples from Mousterian layers at Gubs Rockshelter and Monasheskaya. Should post date EFD4L009 and L013.

Completed By	**Checked By**	**Date**
CIB		

Site Code: Site Name: Gubs Rockshelter I	Date 5/7/04	Context No South wall of Amirkhanov's excavation (Square 3) Layer 2 (lower)	Luminescence Sample No EFD4L009

Description of sampling location:	Sketch of surrounding area
Tube sample from Layer 2, 61 cm below local datum at –1.6 m, 38 cm left from plumb line at RHS of section. Tube taken ~10 cm below rubble in Layer 2, and ~ 5 cm above rubble at top of Layer 5. Layer 2: Upper Palaeolithic, yellow-brown with limestone gravel. Sealed by Layer 1: Present topsoil. Contains Layers 3 (humic layer: similar texture to 2, but darker) and 4 (reddish clayey layer = burning). Some limestone rubble between levels of 3 and 4. Seals Layer 5: limestone stone fall layer above sediment Apparently similar to Layer 2 The section runs ~parallel to the canyon wall, around ~2m from the rock face. In general less limestone and more fines than at Monasheskaya. Short transport colluvial sediments from around the corner?	
	Photo No:

Gamma Dosimetry	Reading	Assoc. Sample	Ref No
	EFD4G012	ZLB for lab γ	

Details:

Rainbow MCA, 2"×2" NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4 π
Gamma dose rate = 0.183 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Lowermost Upper Palaeolithic layer, so date for oldest Upper Palaeolithic at Gubs, and to constrain the youngest Middle Palaeolithic layers.
Should post-date all samples from Mousterian layers at Gubs Rockshelter and Monasheskaya, specifically EFD4L010. Should pre-date EFD4L008 and L013.

Completed By	Checked By	Date
CIB		

Site Code: **Site Name:** Gubs Rockshelter I	**Date** 5/7/04	**Context No** South wall of Amirkhanov's excavation (Square 3) Layer 5	**Luminescence Sample No** EFD4L010

Description of sampling location:	**Sketch of surrounding area**
Tube sample from Layer 5, 76 cm below local datum at –1.6 m, 36 cm left from plumb line at RHS of section. Layer 5: limestone stone fall layer above yellowish brown sediment similar to Layer 2 Sealed by Layer 2: Upper Palaeolithic, yellow-brown with limestone gravel. Seals Layer 6. Apparently similar to lower Layer 5, but less stony. The section runs ~parallel to the canyon wall, around ~2m from the rock face. In general less limestone and more fines than at Monasheskaya. Short transport colluvial sediments from around the corner?	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G013	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4 π
Gamma dose rate = 0.223 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Uppermost Mousterian (Middle Palaeolithic) layer, so date for youngest Middle Palaeolithic at Gubs, and to constrain the oldest Upper Palaeolithic layers. Climatic fluctuations suggested through Layers 5, 6, and 7 (though not published), which are thought comparable with upper Middle Pal layers at Monasheskaya.
Should predate EFD4L008 and L009.
Should post-date EFD4L011.

Completed By	**Checked By**	**Date**
CIB		

Site Code: Site Name: Gubs Rockshelter I	Date 5/7/04	Context No South wall of Amirkhanov’s excavation (Square 3) Layer 6	Luminescence Sample No EFD4L011

Description of sampling location:

Tube sample from Layer 6, 95 cm below local datum at –1.6 m, 38 cm left from plumb line at RHS of section.
Layer 6: Apparently similar to lower Layer 5, but less stony.
Sealed by Layer 5: limestone stone fall layer above yellowish brown sediment.
Seals Layer 7: Apparently similar to lower part of Layer 5.
The section runs ~parallel to the canyon wall, around ~2m from the rock face. In general less limestone and more fines than at Monasheskaya. Short transport colluvial sediments from around the corner?

Sketch of surrounding area

Photo No:

Gamma Dosimetry	Reading	Assoc. Sample	Ref No
	EFD4G014	ZLB for lab γ	

Details:

Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4π
Gamma dose rate = 0.160 ± 0.01
Dose rate suggests Layer 6 has different composition to Layer 5

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Middle Mousterian (Middle Palaeolithic) layer. Climatic fluctuations suggested through Layers 5, 6, and 7 (though not published), which are thought comparable with upper Middle Pal layers at Monasheskaya – sample makes part of establishing Middle Palaeolithic chronostratigraphy and linking sites in group.
Should predate EFD4L010.
Should post-date EFD4L012.

Completed By	Checked By	Date
CIB		

<table>
<tr><td>Site Code:
Site Name:
Gubs Rockshelter I</td><td>Date

5/7/04</td><td colspan="2">Context No
South wall of Amirkhanov's excavation (Square 3) Layer 7</td><td>Luminescence Sample No
EFD4L012</td></tr>
<tr><td colspan="3">Description of sampling location:</td><td colspan="2">Sketch of surrounding area</td></tr>
<tr><td colspan="3">Tube sample from Layer 7, 120 cm below local datum at –1.6 m, 40 cm left from plumb line at RHS of section, 10 cm above limestone bedrock.
Layer 7: Apparently similar to lower part of Layer 5.
Sealed by Layer 6: Apparently similar to lower Layer 5, but less stony.
Seals: limestone bedrock.
The section runs ~parallel to the canyon wall, around ~2m from the rock face. In general less limestone and more fines than at Monasheskaya. Short transport colluvial sediments from around the corner?</td><td colspan="2">

Photo No:</td></tr>
<tr><td rowspan="2">Gamma Dosimetry</td><td>Reading</td><td colspan="2">Assoc. Sample</td><td>Ref No</td></tr>
<tr><td>EFD4G015</td><td colspan="2">ZLB for lab γ</td><td></td></tr>
<tr><td colspan="5">Details:</td></tr>
<tr><td colspan="5">Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4 π
Gamma dose rate = 0.165 ± 0.01
Dose rate suggests Layer 7 has similar composition to Layer 6 but different composition to Layer 5</td></tr>
<tr><td colspan="5">Description of Sample:</td></tr>
<tr><td colspan="5">15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.</td></tr>
<tr><td colspan="5">Nature of Dating Problem:</td></tr>
<tr><td colspan="5">Lowermost Mousterian (Middle Palaeolithic) layer at Gubs Rockshelter: use to establish age range for site. Climatic fluctuations suggested through Layers 5, 6, and 7 (though not published), which are thought comparable with upper Middle Pal layers at Monasheskaya – sample makes part of establishing Middle Palaeolithic chronostratigraphy and linking sites in group.
Should predate all other samples at Gubs Rockshelter I (specifically EFD4L011), but may fit into mid sequence at Monasheskaya.</td></tr>
<tr><td colspan="2">Completed By</td><td colspan="2">Checked By</td><td>Date</td></tr>
<tr><td colspan="2">CIB</td><td colspan="2"></td><td></td></tr>
</table>

Site Code: **Site Name:** Gubs Rockshelter I	**Date** 5/7/04	**Context No** South wall of Amirkhanov's excavation (Square 3) Layer 4	**Luminescence Sample No** EFD4L013

Description of sampling location:	**Sketch of surrounding area**
Bag sample from Layer 4, ~20 cm right from plumb line at RHS of section (i.e. just around corner at end of section, where Layer 4 was most visible). However, no location measurements recorded. Layer 4: reddish clayey layer thought to be burnt material. Sealed by Layer 2: Upper Palaeolithic, yellow-brown with limestone gravel, and contains larger limestone rubble immediately above Layer 4. Seals Layer 2 lower: Upper Palaeolithic, yellow-brown with limestone gravel. The section runs ~parallel to the canyon wall, around ~2m from the rock face. In general less limestone and more fines than at Monasheskaya.	
	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	

Details:

Gamma dose rates from Layer 2 upper (EFD4G011) and Layer 2 lower (EFD4G012) are within two times estimated errors and so provide a reasonable surrounding dose rate. Locally the dosimetry is likely to be more variable and would need to be assessed from the samples if possible.

Description of Sample:

Two small ~0.5 g samples wrapped in foil and black bagged, one containing possible charcoal

Nature of Dating Problem:

Apparently burnt material: test for heating and derive approximate date if useful…
If burnt then characteristic of occupation in lower Upper Palaeolithic layers at Gubs, so if sediments yield poor results, this could be used to indicate earliest Upper Pal activity and therefore constrain latest Middle Pal.
Possibility of ^{14}C date on charcoal for comparison with luminescence result.

Completed By	**Checked By**	**Date**
CIB		

Site Code: **Site Name:** Monasheskaya	**Date** 5/7/04	**Context No** Modern Surface	**Luminescence Sample No** EFD4L014

Description of sampling location:	**Sketch of surrounding area**
Plastic pot of modern sediment, plus limestone clast samples in zip-lock bags, from the ground surface next to the soil sample, and from the rock face immediately above it. Modern sediment is light greyish brown (i.e. contains humic material), whereas the archaeological layers are generally yellowish brown.	
	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	

Details:

Description of Sample:

5 cm × 5 cm ∅ plastic pot of loose sediment. 2 × zip lock bags of limestone clasts. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Test bleaching of modern sediments and extent of contamination from source rock.
De determination for modern sample?
Should have ~ zero age.

Completed By	**Checked By**	**Date**
CIB		

<table>
<tr><td>Site Code:
Site Name:
Barakaevskaya</td><td>Date

5/7/04</td><td>Context No
Section A-V
Layer 3</td><td>Luminescence Sample No
EFD4L015</td></tr>
<tr><td colspan="2">Description of sampling location:</td><td colspan="2">Sketch of surrounding area</td></tr>
<tr><td colspan="2">Bagged sample from thin (~6 cm thick) remains of Layer 3.
Layer 3: Only Palaeolithic layer at site, but Middle Palaeolithic and contained hearths at base and human remains (mandible + teeth).
Sealed by: loose modern material placed to protect section.
Seals: limestone bedrock
Complete excavation of the site has left only the remains of a section at approx. A-V, under large limestone boulders present as a result of cave roof collapse. Section A-V runs W-E parallel with the canyon wall. Sample taken approx. level with point 128 on plan.</td><td colspan="2">

Photo No:</td></tr>
</table>

<table>
<tr><td rowspan="2">Gamma Dosimetry</td><td>Reading</td><td>Assoc. Sample</td><td>Ref No</td></tr>
<tr><td>EFD4G016</td><td>-</td><td></td></tr>
<tr><td colspan="4">Details:</td></tr>
<tr><td colspan="4">Rainbow MCA, 2”×2” NaI Probe, 600 s counting time
No hole as such, but surrounded by bedrock, sediments, boulder, and cave roof
Est. Solid Angle = 4 π limestone + limited amount of sediment
Gamma dose rate = 0.136 ± 0.01
Probe placed in position from which sample was removed, but will only provide a very approximate assessment of dose rate during burial, since sediments largely removed so most of the geometry is filled by limestone.</td></tr>
<tr><td colspan="4">Description of Sample:</td></tr>
<tr><td colspan="4">Sample material trowelled in bulk into black bag and duct taped.
Not properly light tight on sampling as no light proof blanket (or similar) was present.</td></tr>
<tr><td colspan="4">Nature of Dating Problem:</td></tr>
<tr><td colspan="4">Sample possibly for approximate date, but more to assess the nature of the sample. To date the site one would need to obtain better samples, possibly from outside beyond the limestone boulders – although the stratigraphy here may have been disrupted by colluvial action.</td></tr>
</table>

Completed By	Checked By	Date
CIB		

Appendix 2.3 Field gamma spectrometry forms

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G004.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Monasheskaya	**Measurement Date**	4/07/04
Context	Section У-Г Layer 3A-1	**Spectrum No.**	4

		Field	Analysis (Package = Rainbow3)		
^{40}K in Ch.		487	1494 keV		
Ch. Width (eV)		3			
Count Time(s)	300 Field 600 Anal	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		2187			
Count Rate (cps)		7.29			
Dose Rate (mGy/a)		0.14	.138	.142	.146
Error		.002	.01	.01	.01
Mean Dose Rate (mGy/a)					

Location and geometry

Geometry: ~ 3.5π at surface of section,
Hole depth = 13 cm

Estimated solid angle (π Rad.)	3.8 – 4 π	**4π Gamma dose rate (mGy/a)**	0.14 ± .01

TL Samples
EFD4L001

Date	4/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G005.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Monasheskaya	**Measurement Date**	4/07/04
Context	Section У-Г Layer 3a (3A-5)	**Spectrum No.**	5

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487	1467 keV		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5373			
Count Rate (cps)		8.95			
Dose Rate (mGy/a)		0.175	.177	.194	.185
Error		.001	.01	.01	.01
Mean Dose Rate (mGy/a)					

Location and geometry
Geometry: See EFD4G004
Hole depth = 13 cm

Estimated solid angle (π Rad.)	3.8 – 4 π	**4π Gamma dose rate (mGy/a)**	0.19 ± .01

TL Samples
EFD4L002

Date	4/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G006.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Monasheskaya	**Measurement Date**	4/07/04
Context	Section У-Г Layer 3A-6	**Spectrum No.**	6

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487	1477 keV		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		7655			
Count Rate (cps)		12.75			
Dose Rate (mGy/a)		0.25	.251	.273	.264
Error		.002	.013	.015	.013
Mean Dose Rate (mGy/a)					

Location and geometry
Geometry: See EFD4G004
Hole depth = 13 cm

Estimated solid angle (π Rad.)	3.8 – 4 π	**4π Gamma dose rate (mGy/a)**	0.26 ± .01

TL Samples
EFD4L003

Date	4/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G007.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Monasheskaya	**Measurement Date**	4/07/04
Context	Section У-Г Layer 4	**Spectrum No.**	7

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487	1429 keV		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		6603			
Count Rate (cps)		11.00			
Dose Rate (mGy/a)		0.21	.218	.239	.229
Error		.002	.01	.013	.011
Mean Dose Rate (mGy/a)					

Location and geometry
Geometry: See EFD4G004
Hole depth = 13 cm

Estimated solid angle (π Rad.)	3.8 – 4 π	**4π Gamma dose rate (mGy/a)**	0.23 ± .01

TL Samples
EFD4L004

Date	4/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G008.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Monasheskaya	**Measurement Date**	4/07/04
Context	Section У-Г Layer 4	**Spectrum No.**	8

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487	407 (1467 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		6393			
Count Rate (cps)		10.65			
Dose Rate (mGy/a)		0.21	.208	.226	.220
Error		.002	.01	.012	.01
Mean Dose Rate (mGy/a)					

Location and geometry

Geometry: See EFD4G004, except sampled at base of section, so even closer to 4 π
Hole depth = 13 cm

Estimated solid angle (π Rad.)	3.8 – 4 π	**4π Gamma dose rate (mGy/a)**	0.22 ± .01

TL Samples
EFD4L005

Date	4/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G009.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Monasheskaya	**Measurement Date**	4/07/04
Context	Section Д-Ф Layer 2	**Spectrum No.**	9

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487	407 (1467 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		9031			
Count Rate (cps)		15.05			
Dose Rate (mGy/a)		0.30	.294	.302	.304
Error		.006	.015	.016	.015
Mean Dose Rate (mGy/a)					

Location and geometry
Geometry:
Hole depth = 18 cm

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.300 ± .007

TL Samples
EFD4L006

Date	4/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G010.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Monasheskaya	**Measurement Date**	4/07/04
Context	Section Д-Ф Layer 4	**Spectrum No.**	10

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487	507 (1521 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		6948			
Count Rate (cps)		11.58			
Dose Rate (mGy/a)		0.22	.221	.231	.234
Error		.002	.001	.001	.001
Mean Dose Rate (mGy/a)					

Location and geometry

Geometry:

Hole depth = 13 cm

Estimated solid angle (π Rad.)	3.8 - 4 π	**4π Gamma dose rate (mGy/a)**	0.23 ± .01

TL Samples
EFD4L007

Date	4/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G011.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Gubs Rockshelter I	**Measurement Date**	5/07/04
Context	South wall of Amirkhanov’s excavation (Square 3) Layer 2 (upper)	**Spectrum No.**	1

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487	(1459 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		4880	4913	964	
Count Rate (cps)		8.13	8.19	1.61	
Dose Rate (mGy/a)		0.159	.16	.171	.170
Error		.002	.008	.01	.008
Mean Dose Rate (mGy/a)					

Location and geometry

Geometry:

Hole depth =

Position of sample L008, upper layer 2 Gubs section

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.167 ± .01

TL Samples
EFD4L008

Date	5/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G012.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Gubs Rockshelter I	**Measurement Date**	5/07/04
Context	South wall of Amirkhanov's excavation (Square 3) Layer 2 (lower)	**Spectrum No.**	2

		Field	**Analysis** (Package = Rainbow3)		
^{40}**K in Ch.**		487 (~496)	(1450 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5358	5398	1039	
Count Rate (cps)		8.93	9.0	1.73	
Dose Rate (mGy/a)		0.159	.16	.171	.170
Error		.002	.01	.01	.01
Mean Dose Rate (mGy/a)					

Location and geometry
Geometry:
Hole depth =
Position of sample L009, lower layer 2 Gubs section

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.183 ± .01

TL Samples
EFD4L009

Date	5/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G013.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Gubs Rockshelter I	**Measurement Date**	5/07/04
Context	South wall of Amirkhanov's excavation (Square 3) Layer 5	**Spectrum No.**	3

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487 (~496)	(1504 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		6687	6702	1286	
Count Rate (cps)		11.14	11.17	2.14	
Dose Rate (mGy/a)		0.22	.22	.23	.23
Error		.002	.01	.01	.01
Mean Dose Rate (mGy/a)					

Location and geometry
Geometry:
Hole depth =
Position of sample L010, Layer 5 (Mousterian) Gubs section

Estimated solid angle (π Rad.)	4π	**4π Gamma dose rate (mGy/a)**	0.223 ± .01

TL Samples
EFD4L010

Date	5/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G014.asc (EFD4G---.asc)	**Detector**	2”x 2”
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Gubs Rockshelter I	**Measurement Date**	5/07/04
Context	South wall of Amirkhanov’s excavation (Square 3) Layer 6	**Spectrum No.**	4

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487 (~496)	(1409 keV????)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		4532	4646	922	
Count Rate (cps)		7.55	7.74	1.54	
Dose Rate (mGy/a)		0.147	0.151	0.164	0.161
Error		0.002	0.008	0.009	0.008
Mean Dose Rate (mGy/a)					

Location and geometry

Geometry:

Hole depth =

Position of sample L011, Layer 6, Gubs section

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.16 ± .01

TL Samples
EFD4L011

Date	5/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G015.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Gubs Rockshelter I	**Measurement Date**	5/07/04
Context	South wall of Amirkhanov's excavation (Square 3) Layer 7	**Spectrum No.**	5

		Field	**Analysis** (Package = Rainbow3)		
^{40}K in Ch.		487 (~496)			
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		4979	4939	907	
Count Rate (cps)		8.29	8.23	1.51	
Dose Rate (mGy/a)		0.16	0.161	0.161	0.172
Error		0.002	0.01	0.01	0.01
Mean Dose Rate (mGy/a)					

Location and geometry

Geometry:

Hole depth =

Position of sample L012, Layer 7 (Mousterian) Gubs section

^{40}K position slightly high, but for consistency allow for computer correction.

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.165 ± 0.01

TL Samples
EFD4L012

Date	5/7/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G016.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Gubs Rockshelter I	**Measurement Date**	5/07/04
Context	Section A-V Layer 3	**Spectrum No.**	6

		Field	**Analysis** (Package = Rainbow3)		
^{40}**K in Ch.**		487 (~490)	(1488 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		4174	4177	734	
Count Rate (cps)		6.96	6.96	1.22	
Dose Rate (mGy/a)		0.136	0.136	0.130	0.141
Error		0.002	0.007	0.008	0.007
Mean Dose Rate (mGy/a)					

Location and geometry

Geometry: 4 π including limestone boulder and cave roof, ???π soil…
Hole depth = No hole as such, simply placed in the position from which sample L015 was excavated

Estimated solid angle (π Rad.)	[4 π]??	**4π Gamma dose rate (mGy/a)**	0.136 ± 0.01

TL Samples
EFD4L015

Date	5/7/04
Completed By	CIB
Checked By	