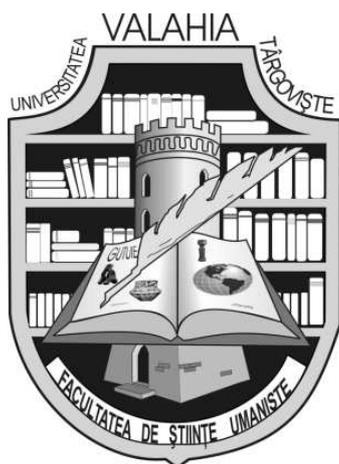


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Paleolithic chert mines on the Avas Hill in Bükk Mountains, Nord-East Hungary

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Abstract: Paleolithic chert mines on the Avas Hill in Bükk Mountains, Nord-East Hungary. The first chert mine excavation on the Avas Hill of Miskolc, in the Bükk Mts NE Hungary, was conducted by Jenő Hillebrand, between 1928 and 1935. Hillebrand, originally, classified the phenomena to the Hungarian Solutrean. Later the dating became totally uncertain. The first real Paleolithic chert mine were unearthed since 1988 at the part of the Avas called “Tüzköves”. These belong to both two transitional industries, Middle to Upper Paleolithic. The first is a Bohunician-like industry with Levallois technique and the second is similar to the Denticulate Mousterian. The latter occurs also in Szeleta Cave at several levels. In 2004-2005 at the western part of “Tüzköves” any others chert mine and workshops have been explored. The interpretation of this chert mine objects exploited by fire-aided stopping and heat treatment, as well as that of the attached processing and camp sites are in progress. The heat-treated chert was used by some kind of prehistoric trade. The typical brown-grey striped, translucent, heat-treated chalcedony of Tüzköves was found in many sites of Bükk Mountain.

Key words: Bohunician industry, chert, flint, Levallois technique, Middle Paleolithic, mines, Szeletian, Upper Paleolithic.

The Avas Hill and its role in the Paleolithic research of Hungary

The Avas Hill of Miskolc has had an outstanding part to play in the history of Hungarian archaeology (fig. 1/1). At its foot, by the Szinva stream, which cuts through the town, the first Paleolithic artefacts, proving the existence of early man in Hungary was found in 1891, and this find gave impetus to Paleolithic research (fig. 2). Two years later Ottó Herman, who studied the renowned “Bársony-ház hand axes”, identified the raw material of the finds as originating from the part of the Avas Hill called “Tüzköves” (“Flinty”), where chert stones of fire making were collected as late as the last century (fig. 3/2-3). This conception of Herman been survived since 1893 to 1963 (O. Herman, 1893; L. Vértes, L. Tóth, 1963).

Since 1906, during the regular excavations in the caves of the Bükk Mountains it

became certain that the chert varieties of the Tüzköves were used for tool making by the Stone Age dwellers of the area at various times.

Between 1928 and 1935 the archaeologist Jenő Hillebrand seemed to find the chert mine of early man near the summit of hill, on the spot of the present look-out tower (fig. 3/1). Hillebrand the first time classified the chipped stone artefacts to the Hungarian Solutrean, known from Szeleta Cave (fig. 1/2). Later in his publication Hillebrand was of opinion the chert mine complex is Mesolithic, Proto-Campignian (J. Hillebrand, 1928).

However, from the then excavated – mostly shaft-type – mine passage, no unambiguous dating has been made. It is only known that chert was quarried from the Neolithic. But most of the mine shafts can be even Middle Age (K. Simán, 1978-1979).

In the 1950s and 1960s in the Avas vineyards and in the 1970s totally replacing them, housing developments began and finds from the most various phases of the Paleolithic were collected in the Herman Ottó Museum.

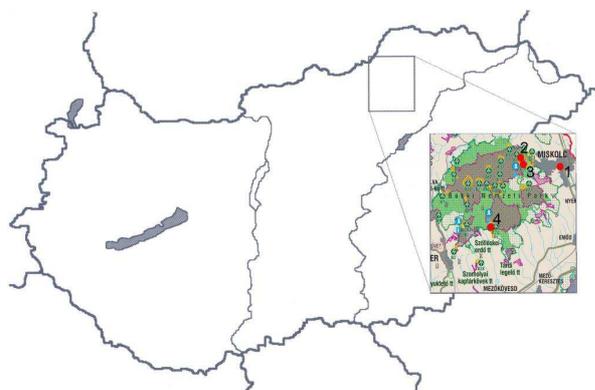


Fig. 1 - Bükk Mountains in Hungary and the sites mentioned in the text: 1. Avas Hill, 2. Szeleta cave, 3. Herman Ottó cave, 4. Suba-lyuk (cave).



Fig. 2 - Hand axe found at the northern hill foot of Avas during the groundwork for the lawyer János Bársony's new house in 1891.

The huge amount of Paleolithic artefacts accumulated could hardly be made by early man from of the cases entirely unsuitable for working.

The decade of investigations even increased the actuality of the questions even increased the actuality of the question: Where are the Paleolithic flint mines of the Avas and what are they like?

The answer of investigations was first provided in 1988, when a Paleolithic site was recovered in the Tűzköves, particularly drawing

attention in the opinion of Otto Herman, during road construction.



Fig. 3 - Northern part of the Avas Hill at Miskolc and the chert mines mentioned in the text: 1. Avas top 1928-1935; 2. Avas-Tűzköves 1988-1989; 3. Avas-Tűzköves 2004-2005 excavations.

Avas-Tűzköves: Árpád Ringer's excavation in 1988-89

In the spring of 1988, during the ground work of the construction of Perczel Mór Street on the Avas Hill a Paleolithic settlement and an adjoin chert mine and workshop were found at about 300 metres distance to the north-north-west from the Herman Ottó Museum (fig. 3/2).

The first Paleolithic artefact, a retouched point of typical Levallois technology (fig. 4) was found by the excavator's work on the line of the street the pavement along the vineyards. The letter was discovered in a trench dug directly beside the fence of the vineyards.

The rescue excavation at this special site was in June 1988. A year later, in July 1989, we had a possibility to unearth the flint bench and its direct environment within a larger section of 4.0 metres by 7.0 metres.

In the 1989 excavation we found the chert bench over an area of approximately 0.8 metres by 1.5 metres. The opal layers covering the bench from above and beneath, which had already been started to be exploited, were left behind in a thickness of 10-10 centimetres. For some reason this part of the bench was not exploited and the twenty to thirty centimetre thick good quality chalcedony was left intact between the layers of opal content. On he other

Paleolithic chert mines on the Avas Hill in Bükk Mountains, Nord-East Hungary

hand towards the north-east wall of the section, mining activity was such intensive that the chert bench was exploited down to the lower layer with opal content. It seems that for some reason the lower opal part of the bench was left there as some sort of floor. The characteristic pieces of a transitional industry from the Middle Paleolithic to the Upper Paleolithic with Levallois technique, for example a Levallois core for points and typical triangular Levallois points removed from it, were found on the surface of the chert beneath and on the floor. On the 5 to 10 centimetre thick lower cultural layer covering the flint bench, up to the surface, the remains of a different culture, similar to the so-called Denticulate Mousterian were unearthed.

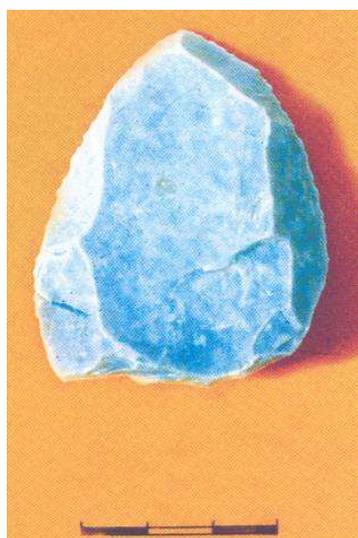


Fig. 4 - Retouched Levallois point from the settlement, near the chert mine, Árpád Ringer's excavation 1988

A great quantity of wastes and opal fragments characteristic of mining were recovered. Among them, two large quartzite pebbles used as hammer stones, which are the usual tools of chert mining, were found, too.

In the south-west corner of the chert bench, one more metre in depth, down to 1.8 metres depth, the traces of prehistoric mining activity gone below the bench level could be followed. The prehistoric mines must have been searching for further chert layers beneath the upper one, but having not found it in the expected depth, they stopped mining.

Avas-Tűzköves: Árpád Ringer's excavation in 2004-2005

The necessary rescue excavation was carried out in 2004-2005, when the Council of the City of Miskolc planned to construct a 428 metres road connecting the top of Avas Hill and Perczel Mór Street (fig. 3/3). The field work at this time was on a 60x14 metres surface in the west part of "Tűzköves" area, where the chert mines, the workshops and the adjoins settlements were in use from the Lower-Middle Paleolithic to the Lower-Upper Paleolithic period (fig. 3).

As the result of the ongoing excavations, a large quantity of heat-treated debris, flints, mined raw materials by flint knapping technique were recovered from the chert mines. Among the aforementioned findings, the finest artefacts were made from originally yellowish-grey semi-transparent chalcedony, on which the signs of change caused by heat treatment could be well observed. At the university of Miskolc, an annealing furnace was used to complete the heat treatment simulations from 0°C to 400°C, raising the temperature by 50°C every time. The yellow spots of the chalcedony turned reddish while the grey turned into a bluish shade. The chalcedony mineralogical examination proved that the flint consisted of mainly silica dioxide. The yellow mark can be traced back to the lepidocrocite. This ferric combination, under heat interaction, dehydrates and turns into hematite (fig. 5)

Besides the colour-changing effect on the flints due to heat treatment, we could also observe a dull surface, which is well known from excavations worldwide, as well as a greasy shine on the negatives of the detached flakes that had been heat-treated. It turned out from the annealing furnace experiments that the non-homogeneous parts of the low-quality chert blocks apart at 300°C, while the inner homogeneous chalcedony was heat treated at 350°C the best. This means that a unique and selective mining could be applied with the use of fire (A. Ringer, S. Szakáll, 2005).

The significance of chert mines and processing sites on the Avas

The chert mine complex of the Avas at Miskolc has a unique importance in Europe, and in addition, through the world. The Paleolithic mining activity of the Avas is really impressive. The quantity of the extracted debris, the number

of chert finds partially or totally retouched within the central 120 metre by 100 metre area, near of the territory of the excavation 1988-1989, reached the one million (fig. 3/2).

This incredibly intensive mining in the Paleolithic period applied special technology. Prehistoric Man first removed the 1 to 1.5 metre thick soil cover and the sand layer overlaying the chert bench, and using “cold technique”, the bench was broken into pieces by large hammer stones. The useless peal layer of the bench was removed, and then, using hammer stones or the so-called fire-heating technique, the part of the bench which bore is best quality was split into pieces of the size of a fist or a double.



Fig. 5 - Stages of heat treatment on the chert stones and selected artefacts from the Avas-Tűzköves, excavations 2004-2005. 1. Denticulate Mousterian core; 2. distal edge of a Micoquian knife, 3. discoid biface.

Applying the latter technique, a thin sandy layer was left on the surface of the 0.3 to 0.5 metre thick flint bench, and by lighting a fire, the chert bench was broken apart. Moreover, the chert material extracted by this method got a

special heat treatment, which made a better manufacture possible.

The heat-treated flint was used by some kind of prehistoric trade. The typical brown-grey striped, translucent, heat-treated chalcedony of the Avas Tűzköves (fig. 1/1; fig. 4/3) was found in the Szeleta Cave (fig. 1/2), Herman Ottó Cave (fig 1/3), Suba-lyuk Cave (fig 1/4), in a 15-40 kilometres distance from Avas Hill in the Bükk Mts, NE Hungary (A. Ringer, S. Szakáll, 2005).

Chronology of the prehistoric chert mining at Miskolc-Avas

In 2006-2007 Daniel Richter of the Max Planck Institute of Germany tried TL dating of heat treated flint debris from the Avas-Tűzköves excavation in 2006. Due to the low temperature heat treating of the samples selected the dating was unsuccessful.

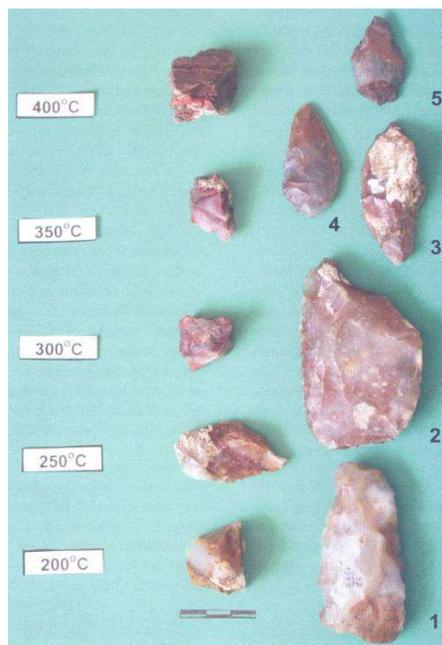


Fig. 6 - Stages of heat-treatment represented by artefacts made from chert stones of Avas-Tűzköves found in the sites of the Bükk mountains. 1. Szeleta cave, layer 3; 2. Suba-lyuk cave, layer 11; 3. Suba-lyuk cave, layer 6; 4. Szeleta cave, layer 6; 5. Herman Ottó cave, layer 2.

Thus for the moment to date the chert mining at Avas can be accomplished indirectly. Finds on figure 3 from cave sites of figure 1 make this possible. Heat treated chert artefacts of

Paleolithic chert mines on the Avas Hill in Bükk Mountains, Nord-East Hungary

Avas belonging to several archaeological cultures were found in different layers of these caves.

The earliest item, a convex side scraper (fig. 6/3), belongs to the industry of Typical Mousterian rich in side scrapers, found at Subalyuk Cave, South Bükk Mountains. This layer most probably dates to the end of MIS 5a, 75.000-70.000 years B.P.

Charentien type industry of this cave from the upper cultural layer complex, layers 10-14, probably dates to the MIS 3, 60-45000 years BP. The heat treated flint artefact of layer 11 (fig. 6/2) can be dated to this time interval (Z. Mester, 2005).

In the past decade, it was possible to radiocarbon date the Szeletian cultural layer of Szeleta cave and the early Upper Palaeolithic cultural layer of the nearby Herman Ottó cave with the cooperation of Brian Adams and Marcel Otte (B. Adams, 2002; A. Ringer, S. Szakáll, 2002).

Among these the age of the heat treated Avas chert artefacts (fig. 6/1, 4) of the Szeletian at Szeleta cave is between 44 and 22.000 years B.P. according to the C-14 dating results of the Laboratory of Chicago.

The conventional C-14 dates from the lower part of layer 3 and from the upper part of the layer 6 at the Szeleta cave: 42.960 ± 860 B.P. (ISGS 4.464) and 22.107 ± 130 B.P. (ISGS-A-0131). The age of the heat treated artifact (fig. 6/5) from Harman Ottó cave layer 2 is 35.680 ± 630 B.P. (Beta-17.8807) (P. Szolyák, 2011).

Conclusion

The chert mining with fire at the Avas hill of Miskolc is unique in Europe. It cannot be ruled out that the practice of heat treatment was

born in this continent. Thus it can be proposed that this Paleolithic innovation spread from here to western Eurasia.

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