ABSTRACT BOOK AND CONFERENCE GUIDE

OIS 3 Conference
Anthropos Pavilion, 15th - 17th of March, Brno 2010

OIS 3

Brno 2010

organized by:
Institute of Geology of the Academy of Sciences v.v.i. in Prague together with Moravian Museum in Brno, the Institute of Archaeology of the Academy of Sciences, v.v.i. in Brno, by the Quaternary Group of the Czech Geological Society and by the Department of Archaeology, University of Cambridge

The conference is dedicated to doc. PhDr. Karel Valoch, DrSc, to his 90th birthday anniversary.

Karel Valoch began his famous work at the Moravian Museum on 1st December 1952. From then until the present he has tirelessly uncovered the mysteries of the Palaeolithic.
Hardly anybody has better qualification than him: together with his brother Hugo and brother-in-law Francis Čupik he took part in the first survey of the Moravian Karst, and therefore he was probably able to recognise all Palaeolithic artefacts as a 3 year old boy. Secret research at the Magdalenian site of Býčí skála must have been a great night adventure! Later he cooperated closely with Karel Absolon, who consulted him on his first discoveries.
Karel Valoch diligently travelled because he preferred to view new finds and sites personally and discuss scientific problems with his colleagues face to face. And sometimes it really was adventure...
Sometimes we jokingly say that he writes about the Palaeolithic era because he remembers Palaeolithic people personally!
He is always glad to share his exceptional personal experiences and memories with us. Karel is still open to new ideas and practices and he doesn't hesitate to apply them in his work.

We hope he will continue his research with unceasing creative energy, and we look forward to celebrating many more birthdays with him over a glass of wine in the future.

Karel's bibliographic index is truly impressive, containing over 350 items: (http://www.mzm.cz/mzm/ostatni/valoch_biblio.html).

Overview of his archaeological excavations:

1953-1954 (together with R. Musil) loess excavation at Brno and the Vyškov vicinity.
1954 (with R. M.) excavation of the Palaeolithic site in Rozdrojovice near Brno.
1955 excavation of the cave Žitného near Křtiny.
1956-1958 (together with R. M.) excavation of Pod hradem Cave.
1957 excavation of the Palaeolithic site in Neslovice
1959-1960 excavation of the Mesolithic site near Smolín
1961-1976 excavation of Kůlna Cave
1969-1972 rescue archaeological excavation in Brno-Bohunice (Kejbaly)
1973 rescue archaeological excavation on Vídeňská street (Koněvova)
1974-1975 geological excavation at Kupařovice I
1976 excavation of the Palaeolithic site in Vedrovice II
1980 (together with L. Seitl) excavation of the Palaeolithic site in Jarošov
1982 excavation in Stránská skála III-1
1982-1983 excavation of the Palaeolithic site in Vedrovice V
1985 (together with L. Seitl) excavation of the Palaeolithic site of Maršovice II
1996-1998 lower Palaeolithic excavation in Stránská skála I (supported by Ford's foundation)
2001-2002 (together with P. Neruda and Z. Nerudova) excavation of Puklinová Cave
2001-2002 (with P. Neruda and Z. Nerudova) participation on the rescue archaeological excavation in Balcarka Cave.

(written by Zdenka Nerudova and Petre Neruda)

PROGRAM OF OIS 3 STAGE CONFERENCE
15th – 17th of March 2010

OIS 3

Brno 2010

Monday 15th of March 2010
Where: pavilion Anthropos, Pisarky, Brno (**see city map in attachment)**
16:00 registration, bookselling
17:00 ice break party including degustation of Moravian vine and listening (dancing?) to classical Moravian "cymbal" music

Tuesday 16th of March 2010
Where: pavilion Anthropos, Pisarky, Brno

8,00 to 9,00 late registration, bookselling, poster hanging, light breakfast and coffee
9,00 official opening with some words from director of Moravian Muzeum PhDr. Mgr. Martin Reissner

9,15 1.session - (chairman J.K.Kozlowski)

9,15 - 9,40 **Mellars P. (speaker):** Problems in the Modern Human Colonization of Europe
9,40 - 10,00 **Pirson S., Damblon F., Court-Picon M., Abrams G., Bonjean D., Di Modica K., Draily C., Stewart J.R. and Haesaerts P.:** New data from OIS 3 in Belgium: loess and cave records
10,00 - 10,20 **Gaudenyi T. and Jovanovic M.:** Paleoenviornment of V-L1S1 (~MIS 3) recorded at Roglic gully of Titel Loess Plateau (Vojvodina, Serbia) based on molluscan studies.

10,20 - 10,50 coffee break

10,50 - 11,10 **Jones M. K.:** Economic plants and human ecosystems in OIS3.
11,10 - 11,30 **Urbanowski M., Orzyłowska K.:** Missing link? Problem of distinguishing OIS 3 sediments in Polish caves.
11,30 - 11,50 **Wisniewski A., Adamiec G., Badura J., Bluszcz A., Kabała C., Kowalska A., Murczkiewicz M., Musil R., Przybylski B., Skrzypek G., and Stefaniak K.:** Weichselian Landscape and Middle Palaeolithic settlement within the Odra Valley:

new evidence from Hallera Avenue in Wrocław (SW Poland).

11,50 - 12,10 **White D., Stringer Ch., Cullen V., Lane Ch. and Lewis M.:** Microtephra and the Middle-Upper Palaeolithic "transition" in Europe.

12,10 - 13,10 lunch including poster session

13,10 2. session - (chairman J.A. Svoboda)

13,10 - 13,35 **Nigst P.R. (speaker), Viola Th.B., Haesaerts P., Damblon F., Frank F., Mallol C., Niven L., Trnka T., and Hublin J.:** New research on the chronostratigraphy of the Early Upper Palaeolithic in Central Europe: excavations in Willendorf II, Austria (2006 - 2009).

13,35 - 13,55 **Neruda P.:** Middle Danube Region During the Stage 3 - Cultural Implications

13,55 - 14,15 **Haesaerts, P., Borziac, I., Chirica, V., Damblon, F., and Koulakovska, L.:** Loess and Upper Palaeolithic in Central Europe : climatic environment and chronology.

14,15 - 14,25 coffee break

14,25 - 14,45 **Kalicki T., Kaminska L., Kozłowski J.K., and Mester Z.:** Interplenniglacial profiles on open-air sites in Slovakia and Hungary.

14,45 - 15,05 **P.Fajer M., Foltyn E., and Waga J. :** Organization of the settlement of cultures of the Upper Palaeolithic on northern foreland of the Moravian Gate.

15,05 - 15,25 **Škrdla P., Tostevin G., Nývlt D., Lisá L., Richter D., and Nejman L.:** New Data on Hominin Occupations in the Brno Basin during OIS 3

15,25 - 15,35 coffee break

15,35 3. session (chairman P. Neruda)

15,35 - 16,00 **Svoboda J.A. (speaker):** Microstratigraphies in the Gravettian settlements Chronological stages or occupation episodes?.

16,00 - 16,20 **Lisá L., Nývltová Fišáková M., Jones M. K., Komar M. Vandenberghe D. and Petr L:** The environmental conditions within the Moravia and southern Silesia during Gravettian period and its impact to the behavior of Palaeolithic hunters.

16,20 - 16,40 **Sinitsyn A. A.:** East European archaeological and geological sequences at MIS 3: Kostenki model.

16,40 - 17,00 **Vlačiky, M. and Michalík, T.:** Interdisciplinary research of Gravettian site Trenčianske Bohuslavice – Pod Tureckom (Slovak Republic) in 2008.

17,00 - 17,10 coffee break

17,10 - 17,30 **Stevens R. and Pryor A.:** Isotopic investigations of climate and seasonality during the Moravian Gravettian.

17,30 - 17,50 **Noiret P. and Otte M.:** Aurignacian and Gravettian occupations in Eastern Europe between 33.000 and 23.000 BP

17,50 - 18,00 **official ending of OIS3 stage conference**, the instructions for social dinner, guided tour in night Brno and next day excursion. Taking collective photograph in front of famous Anthropos mammoth.

18,00-20,00 moving to the centre of Brno, guided tour in night Brno

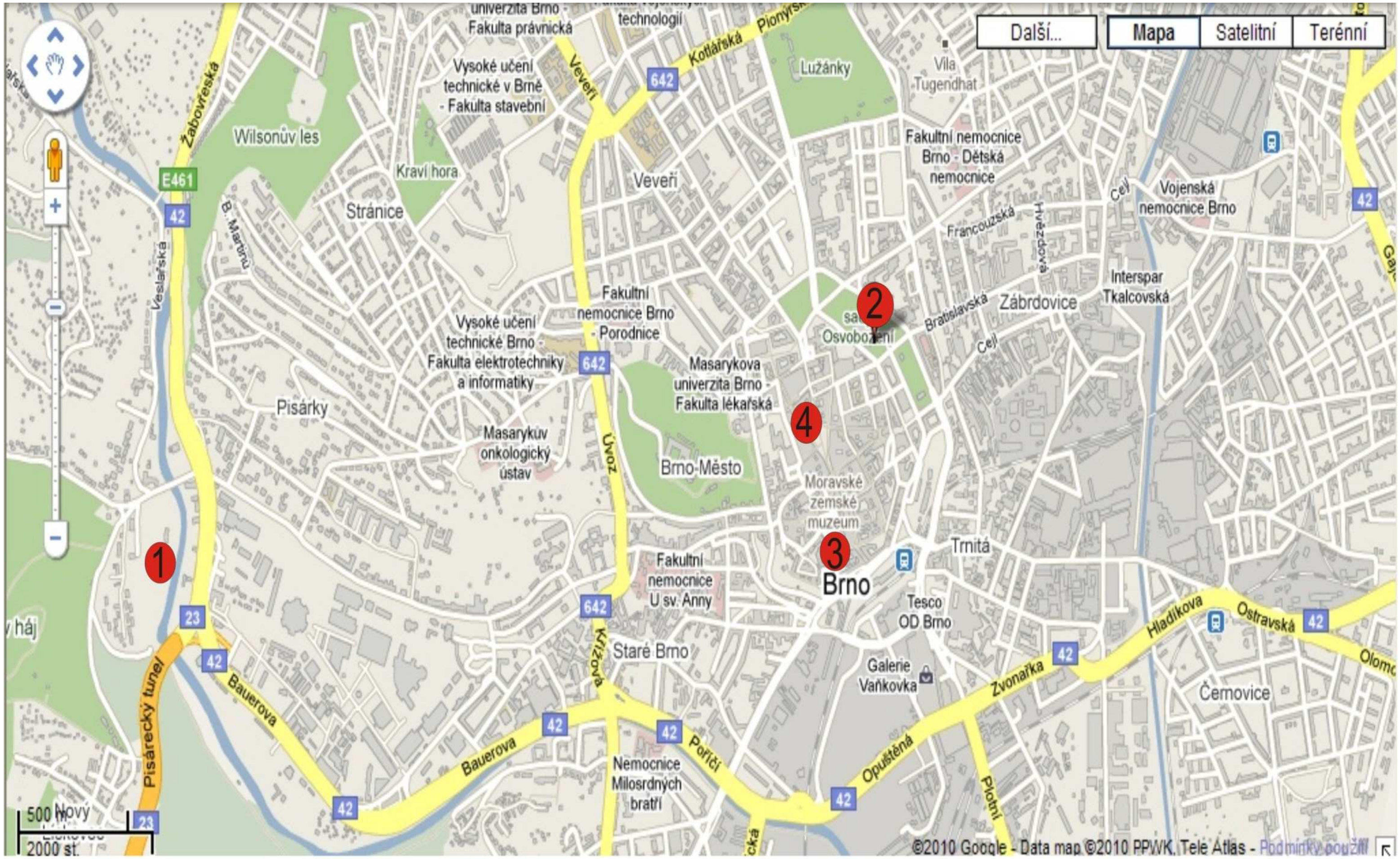
from 20,00 **social dinner** in Medieval pub, street Ceska, meeting for participants of social dinner will be in the centre of Namesti Svobody square, near so called hungry column.
(see city map in the attachment)

Posters:

Döppes D., Rabeder G. & Stiller M - The Middle Würmian warm period in the High Alps
Michalík T. - Gravettian Occupation and Settlement Strategy in Trenčín Basin (Slovakia)
Mlejnek O. - Tvarožná I. – site of developed Aurignacian in southern Moravia
Moravcová (Ábelová) M. - Environment and climate changes during OIS 3 and OIS 2 in Moravia and Slovakia on the base of stable isotopes.
Neruda P.: Reconstruction of the Spatial Distribution of Micoquian in Kůlna Cave (Moravia, Czech Republic).
Neruda P., Galetová M., Dreslerová G. - Taubachian and Micoquian Retouchers from Kůlna Cave, Czech Republic
Nerudová Z. - The settlements strategies in the Krumlov Forest region (South Moravia, Czech Republic) during OIS 3 stage.
Nyvltova-Fisakova M. - Seasonality of Gravettiean sites in the middle Danube
Pryor A. J. E., Stevens R. E., Wojtal P. and O'Connell T.C.- Investigating climate at the site of Krakow-Spadzista using oxygen isotopes

Wednesday 17th of March 2010
Excursion – The departure will be at 8 a.m. in front of Janáčkovo divadlo ("Janacek Theatre", **see city map in attachment**).
For participants will be prepared lunch packet. All sites, except DVII site (30 minutes by walk) are situated near the bus parking place, but we recommend bringing with you an umbrella or a mackintosh and good shoes.

Program of excursion:
8,00: departure from Brno (meeting point is in front of Janacek Theatre)
9,00 -12,00: **Dolní Věstonice, Pavlov, Milovice**
12,00 -13,00: return to Brno
13,00 -14,00: **Stránská skála, Líšeň**
14,00 departure to the Moravian Karst
14,30 - 15,30 **Kůlna Cave**
15,30 -16,00 **Balcarka Cave**
Approximately 17,00 arrival to Brno in front of Janacek Theatre.



1 - Pavilion Anthropos
2 - Janacek theatre
3 - Moravian museum
4 - Medieval pub

ABSTRACTS

The Middle Wurmian warm period in the High Alps

Döppes D.[1], Rabeder G.[2] & Stiller M.[3]

[1] *Reiss-Engelhorn-Museen, Mannheim,*
[2] *Österr. Akademie der Wissenschaften, Biologische Station Lunz und Universität Wien, Institute für Paläontologie,*
[3] *Max Planck Institute for Evolutionary Anthropology, Leipzig*

The time range of 65-30ka BP is termed the Middle Wurmian warm Period, which corresponds approximately to the Oxygen Isotope Stage OIS3. The High Alpine caves (Fig. 1) have proven to be especially sheltered areas, which were once inhabited by herbivore cave bears that had to obtain their sustenance from the environment around the cave. Mainly fossil bones and teeth of cave bear provide us with information of past climatic conditions, because firstly, they can be dated using the radio-carbon method and secondly, originate from animals which lived in these High Alpine regions. Basis of this study are therefore radiometric and chronostratigraphic age data of taxonomically determinable cave bear remains from High Alpine sites, as well as reflections on the relation between their diet and the past climate.

Since today the caves are located in a vegetation-poor to vegetation-free environment, which could not offer the herbivorous cave bear sufficient food resources, the conclusion is drawn that the Middle Wurmian was warmer in the Alps than today. Agreeing and contradictory data from soil formations in loess sequences and from sinter data in caves are discussed.

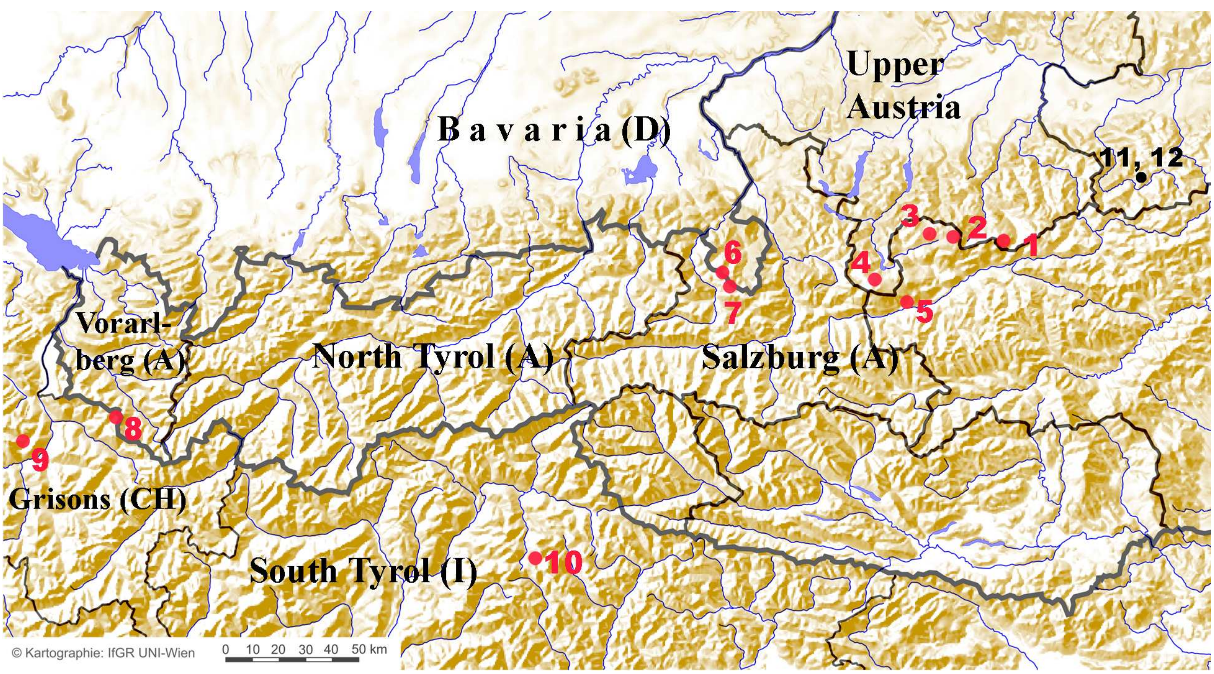


Fig. 1. High Alpine cave bear sites in Austria, Germany, Switzerland and Italy
1 Ramesch-Knochenhöhle. 2 Brieglersberghöhle, 3 Salzofenhöhle, 4 Schreiberwandhöhle, 5 Schottloch, 6 Schneiberhöhlen, 7 Äußere Hennenkopfhöhle, 8 Sulzfluh-Höhlen, 9 Drachenloch bei Vättis, 10 Conturineshöhle, 11 Schwabenreith-Höhle, 12 Herdengelhöhle

Organization of the settlement of the Upper Palaeolithic cultures in the northern foreland of the Moravian Gate

Fajer M.[1], Foltyn E., Waga J. M.[2]

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There are different landscape zones in the vicinity of the Moravian Gate and in its northern foreland. The basis of their assignation include most of all land relief, geology, and drainage pattern. Other elements of the environment have undergone significant changes for the last several millenniums.

The following landscape zones were distinguished: mountains, foothills, foothill high plains, plateaus covered with loess, near-upland high plains, uplands, moraine hills and other forms of the ice-sheet marginal zone, water-glacial plains, higher river terraces and alluvial fans, lower river terraces within valley floors. Each of the landscape zones provides different conditions for the settlement and human activity.

At the interpleniglacial period, bohunician, seletien, aurignacian and gravettien cultures entered from the south and reached the area north of the Moravian Gate. These were communities showing many differences in equipment, economic habits, socioorganization and settlement habits. General conclusion may be drawn, that there were four different settlement-adaptive systems, derivatives of environmental conditions and economic factors.
Bohunician model meant „ lasting” in narrow territorial frameworks delimited by the contour line of 310 m a.s.l., in the vicinity to fourth-order streams, within hillsides exposed to the south, far away from mountain tops.

Other model, more „impetuous” refers to the seletien culture. Large mobility brought the increase in settlement intensity and extension of the occupied areas. During cyclical migrations they went towards the north, south and east hillsides located at the height of 217 - 300 m a.s.l., penetrating the stream valleys usually of the fourth- and second-order.
An original feature of the aurignacian model is breaking a „ mountain barrier” which resulted in setting up their sites at the northern, eastern and southern hillsides at the height of 205 - 630 m a.s.l.

The last - gravettien model represents a specific synthesis. Gravettien culture does not avoid lowland areas and also does not enter the mountains very expansively. A location of their campsites occurs continuously at the southern, eastern and western hillsides at the height of 220 - 300 m a.s.l. More stable settlement forms were situated on hilltops and naturally defensive places, for example in the shadow of the elevations, or at the streams of second-, third- and fourth-order.

Seasonal migrations to the north foreland of the Moravian Gate were taken up to look for raw materials (aurignacian, gravettien, seletien). Additionally they were hunting (bohunicien, seletien), including hunting in the mountains (aurignacian, gravettien).

Paleoenviornment of V-L1S1 (~OIS 3) recorded at Roglic Gully of Titel Loess Plateau (Vojvodina, Serbia) based on molluscan studies

Gaudenyi, T.[1] and Jovanovic, M.[2]

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Titel Loess Plaetau is located at the south-eastern part of the Carpathian Basin (Vojvodina, Serbia). The examined loess series at open section Titel-Rogulic Gully of this nearly 80 km2 loess plateau are situated on the central part of the right bank of the Tisza river. Malacological analysis was the main method used in this study as an independent tool to reconstruct paleoenvironments and paleoclimates of loess series at local/regional level. The study was supported by grain size and magnetic susceptibility proxies and numeric age dating (using optically stimulated luminescence). Collection of 10 litres volume samples was conducted at 10 cm intevals in continuous columns (11.8 m in height) for high resolution quantitative analysis. The Lower Pleniglacial correlated with the V-L1L2 (~ OIS 4) sandy loess layer with poor *Striata*- and *Pupilla* faunal assemblage which is confined rather to the rather temperate climatic and a sparse grassland, steppe-like environment. Based on the coarser sand distribution and sand laminations, the dominant influence was the local south-eastern (paleo)Košava wind.

The evident changes obseved at the beginning of Middle Pleniglacail of the V-L1S1 (~ OIS 3) unit, which showed that the initial (embryonic) pedocomplex substitutes the sandy loess and the ruling *Pupilla*- and *Striata* faunal assemblage shows similarities to the recent Central European dry steppe-like grassland climatic and environmental conditions.
The Upper Pleniglacial of V-L1L1 (~ OIS 2) loess horizon with the dominance of the *Pupilla* fauna in the assemblage, represents the coldest parts of the last cold stage. LGM is clearly manifested with *Granaria frumentum* minimum and the only abundance of the cold demanding *Columella columella* species in traces (less than 1%) are evident. The steppe-like paleoenvironment was not too extreme and more similar to the OIS 3 interstadial in some places of Bohemia and Moravia.

The results suggests that the Titel Loess Plateau during the last cold stage/Pleniglacial (~ OIS 4-2) was outside of the periglacial zone of the Carpathian Basin and that the paleoclimate corresponds to rather moderate cold than to extremely cold continental climate which belongs to the pseudoperiglacial zone. The climatic zonality based on Central European molluscan assemblages is associated to the dry loess steppe-like landscape. OIS 3 stage show and more arid character (lacking of the humidity) with relatively temperate climatic values in comparison with the recent climate of the investigated area.

Loess and Upper Palaeolithic in Central Europe : climatic environment and chronology

Haesaerts, P.[1], Borziac, I.[2], Vasile Chirica, V.[3], Damblon, F.[1], and Koulakovska, L.[4]

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Recent studies of open-air Palaeolithic sites from Central Europe allow a new insight on the climatic background and chronology of the middle pleniglacial (OIS 3 stage). It concerns mainly two groups of sites : Willendorf, Stránská skála and Dolni Vestonice in the Middle Danube Basin, Molodova, Mitoc-Malu Galben and Cosautsi in the East Carpathian Area. Each group constitutes the core of a renewed regional palaeoclimatic sequence for the middle pleniglacial, with a chronological frame based on large series of consistent radiocarbon dates on high-quality charcoal. The conjunction of these complementary sequences confirms the predominance of highly unstable environmental conditions on the scale of Central Europe during this period. This approach also provides a new perspective on the distribution through time of large sets of Palaeolithic occurrences, from Late Mousterian to Gravettian, including Bohunician, Szeletian and Aurignacian.

Economic plants and human ecosystems in OIS3

D. Beresford Jones[1], K.Johnson[1], M.Steele[1], S.Taylor[1], and M.K.Jones[1]

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Our growing knowledge of the importance of meat in Palaeolithic diets has brought into focus a new importance for plant foods. The role of plants may have been to dilute rather than enrich early diets. Lean meat consumed alone, while providing many nutritional needs, also overburdens the system with nitrogen, which can reach toxic levels. A considerable quantity of energy foods low in nitrogen are needed to balance high levels of meat consumption. A survey of recent and extant hunter gatherer diets reveals that this dilution is achieved through some combination of plant food and fat, collectively making up around 50% of the dietary intake. The spread of early humans into northerly latitudes is likely to have been limited, at various stages by the limited availability of plant food and/or fat resources. This paper reviews recent archaeobotanical findings from the Moravian corridor, and the light they shed upon the Palaeolithic quest for plant food.

Two recently examined sites in the Moravian corridor, at Dolni Vestonice and Predmosti, provide the principal data for this review, in the form of charred plant remains collected through systematic flotation. These charred remains are derived from a combination of wood, roots or tubers, and leaves (conifer needles), between them, they provide information on the environment in which the food quest was pursued, some of the resources consumed, and the formation processes of the charred remains themselves.

From the charred wood, the tree ring densities provide a direct record of the intensity of environmental extremes. The seeds and roots or tubers may provide some insight into the plants gathered and consumed. The conifer needles provide site formation clues that assist in understanding contrasts in data between the two sites. These various analyses and their implications are discussed.

Interpleniglacial profiles at open-air sites in Slovakia and Hungary

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[4] ELTE, Budapest University, Hungary

Studied areas are located southward of main range of the Carpathians in the Danube drainage basin: three of them (Andornaktálya, Kövágó and Kőporos) in Eger basin and one (Trenčianska Turná) in Vah valley.

Hungarian profiles are located on southern slope of Bukk Mountains on the both side of the Eger valley. The profile of the Palaeolithic site of Zúgó-dülö at Andornaktalya consists of three members: the ploughing layer of present soil (I), a buried soil (II) and the weathering cover of the Pannonian sandy loam (III). Sedimentological and micromorphological studies were performed. Traces of ice wedges indicated cold stage before soil formation. There were filled to secondary calcium carbonate during formation of the Interpleniglacial soil (30 180±330 BP). The micromorphological structures (biofeatures, channels, bow-like structures after earthworms) proved of an existence pedogenesis at that time. Soil was covered with slope deposits during maximum of the Last Glaciation. The lower archaeological level in this site appears in the Interpeniglacial soil and represents the typical Aurignacian close to the Eastern Slovakian sites in Hornad valley. The upper horizon – in slope deposits – continues the similar technological tradition and corresponds to the Late Phase of the Aurignacian or to the Epi-Aurignacian. The raw material spectrum strongly differs from lower level showing a large number of transcarpathian flints. At Kővágó no traces of pedogenesis has been observed. The undifferentiated loamy deposits sedimented in several episodes appear in the profile above the loamy-sandy layer of pre-Pleniglacial age preceding the AMS dating of 28 170±200 BP. In these loamy-sandy deposits occur artefacts of the Initial Upper Palaeolithic with volumetric blade technology made mostly on the local (10 km) Egerbakta silicified sandstone. In the lower part of loamy colluvia workshop activities for production of Szeletian leaf points (mostly from quartz-porfire) are present. Sediments at Köporos profile are very similar to those from other sites in the Eger basin and they are under study. Archaeological finds from this site, initially attributed to the „Grossgerãtige Mesolithikum“ represent several occupational phases from the Middle to Upper Palaeolithic, including Mousterian and Micoquian, Initial Upper Palaeolithic with volumetric macro-blade technology, traces of the Aurignacian and of the Upper Szeletian.

Slovakian profiles (Trenčianska Turná-Vrlačka 1, Trenčianska Turná-Vrlačka 2, Trenčianska Turná-Hamre) are located on western slopes of Považski Inovec. Hiatus of sedimentation between the Eemian and beginning of the Upper Pleniglacial are reflected in the profiles. Upper part of the Eemian soil was destroyed by processes of slope wash (S3 outcrop), probably in the beginning of the Vistulian, and then Bt horizon of this soil was transformed by the cryoturbation in some phases simultaneously with loess accumulation. Solifluction was developed during the maximum of the Upper Pleniglacial and just after (TL dating from the loess of Trenčianska Turná-Vrlačka – 16.7±06 kyr BP). In Bt horizon of the Interpleniglacial soil are present Micoquian artefacts, including the unfinished bifacial point (Trenčianska Turná-Hamre). Leaf points appearing on the surface (Trenčianska Turná-Hamre, Za dvorom site) correspond to the hiatus existing in the profiles between the Eemian and the Upper

Pleniglacial and could be the equivalent of the Late Middle (Late Micoquian) and Early Upper Palaeolithic (Szeletian) industries with leaf points. Post-Pleniglacial loess cover in the region of Trenčin furnished, in several points, Epigravettian artefacts.

The environmental conditions within the Moravia and southern Silesia during Gravettian period and its impact to the behaviour of Palaeolithic hunters.

Lisá L.[1], Nývltová-Fišáková M.[2], Jones M. K.[3], Komar M.[4] and Petr L[5]

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[2] *Institute of Archaeology in Brno, Academy of Sciences of the Czech Republic, Brno, CR*
[3] *Department of Archaeology, University of Cambridge, CB2 3DZ, Great Britain*
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[5] *Department of Archaeology, Faculty of Philosophy, University of West Bohemia, Sedlackova 15, Plzen, CR*

The question of what the Palaeolithic landscape within Moravia looked like, how humans understood that landscape, whether they were able to exploit it for hunting, and how they adapted to the landscape morphology for their daily life is central to all interpretations. Three main Gravettian localities within the Moravian corridor with sedimentological records of the last 30 000 years are included into this case study. The well known and long-studied site of Dolní Věstonice in south Moravia, the site of Předmostí situated close to the Moravia/Silesia border, which has yielded the largest mammoth bones accumulations in Central Europe, and the locality of Hošťálkovice in the southern edge of Silesia in the north east Czech Republic.

Each of those three localities is located in the valley bottom of a big river, typically on their western bank. Each contains aeolian material deposited during the Last Glacial period and was influenced by the climatic changes of the Last Glacial period. We also note that each may have been characterised by a prominent whit exposure, e.g. limestone rocks, potentially serving as a visual cue to meeting points in the landscape.

All of three localities are composed of loess deposits, but of the degree of preservation and alteration varies greatly. Southern Moravia has the best preserved localities. Typically 4-5 meters of loess overlies the cultural layers. The loess deposition was quite continuous due to the rich source of loess material (alluvial deposits, Neogene deposits, weathered eluvium). Also postdepositional influence e.g. climatic conditions were quite mild comparing with the other localities included into the project. At Predmosti, sedimentological features display significant redeposition within the cultural layer as well as after the cultural layer deposition. This was probably due to higher humidity which caused slope processes. The depths of deposits are lower i.e. the number of hiatuses is higher in this case. Hostalkovice locality is so strongly influenced by postsedimentary processes that patterns of depositional process are very difficult to find. Also the mass of loess deposits above cultural layer is very thin comparing with more southerly situated localities.

The climate during Gravettian period was probably quite mild and dry in southern Moravia, mild and more humid in central Moravia and very cold and humid in Northern Moravia. Another tool for the climatic interpretations is the palynological research. The main pollen contributors to the pollen sequences of DV are *Picea, Abies cf. sibirica, Pinus* (*P. sylvestris and P.cembra*), Asteraceae, *Artemisia*, Chenopodiaceae, and to a lesser extent, Poaceae, Brassicaceae, and Quercus. Some minor types such as *Polygonum aviculare* type, *Plantago lanceolata* appear perhaps as an indicator of human activity. The landscape was typical by expansion of steppe vegetation of xerophilic type. Trees and shrubs were kept in rivers valleys and deep narrows. Předmosti site has a poor pollen spectrum typical by Fagus (beech). The dry, steppe-like character is indicated by pollens of Poaceae, Chenopodiaceae and Botrychium. Urtica (nettle) may indicate anthropogenic influence. Predmosti site is comparable with DV, indicating mild conditions.

What were the patterns that enabled humans to exploit the North European Plain, and subsequently even colder regions? Is it true that hunters followed mammoths to hunt them? Or were they just migrating within the landscape looking for more suitable place for everyday life. Recent research suggest that the mammoth was not the predominant source of meat protein. The principal animals hunted were wolfs, foxes and small fauna. If Palaeolithic hunters were not dependent on mammoth meat per se, what was than the purpose of hunting them. Did they need their meat, or ivory or bones or fat? Each has a rationale. A large amount of meat will help to improve the diet and to hunt in the group may consolidate social grouping. Ivory is a ideal material for art production, which is also has social and cultural context. Bones, when exposed to the sun produce an extremely white colour, which we have tentatively speculated may serve as a landscape marker.

The question is why the pattern shows humans moving further and further north. Whater its purpose, the link with mammoth hunting may be central. Mammoths were migrating to the North to spend their summer and to feed themselves for in preparation for the bleak winter they would subsequently spend in south. As the climate become increaslingly cold and arid it was probably still more and more difficult to move through the landscape, now with less vegetation and water in the valley bottoms. If fat was the critical resource from mammoths, then the best time when to hunt mammoth was when the mammoth was still strong and didn't lost his weight (as well as the fat). And if mammoths didn't migrate so often to the south, people had to move to the North or to he East (to the Carpathian valley refugees) to meet them. It is known that the North was more cold, but also in some cases more humid. There was not higher precipitation, just better conditions for keeping the humidity because of the presence of permafrost. For example, the Northern Siberian Plains, now influenced by permafrost and cold and humid, produce quite suitable conditions for plant growth, because the recently frozen layer holds the humidity needed for plant growth. In spite of the low temperatures, such an environment offered much better conditions for mammoths than warmer but arid conditions of the South.

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Problems in the Modern Human Colonization of Europe

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The patterns of dispersal of biologically and behaviourally modern humans across Europe have been greatly clarified over the past five years as a result of new developments in both radiocarbon dating and associated archaeological evidence. This paper will briefly review these recent developments, and also ask what light they may shed on the patterns of interactions between intrusive modern and local Neanderthal populations in different regions of Europe, and the eventual extinction of the Neanderthals.

Gravettian Occupation and Settlement Strategy in Trenčín Basin (Slovakia)

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Trenčín Basin is geographical unit, situated in the western part of Slovakia. It is surrounded by highlands chains of Biele Karpaty, Strážovské vrchy and Považský Inovec. Main axis of Trenčín Basin is the river Váh, which flows from NE to SW and divides the basin to two parts on the right and on the left bank of the river. Main characteristic features, which define the Trenčín Basin geographically are Trenčín castle rock and Skalka in the NE part and Beckov castle rock in the SW part. We presume, that these geological formations played important role in the Gravettian settlement strategy as remarkable orientation points. Long low hills covered by the loess and divided by the little streams are the other characteristic feature of the basin, so the geomorphology is similar to the famous Piešťany region, intensely occupied during the Gravettian period.

Before 1918 only several sporadic traces of Palaeolithic settlement were known from Trenčín region. In 1920´s two cultural layers of Palaeolithic settlement were discovered in Zamarovce. The second examined site was Ivanovce, where traces of Early Upper Palaeolithic were found. In 1965 results of short research of Upper Palaeolithic site Trenčín IV were published by Juraj Bárta, but finds from this locality provided only unsufficient data to classify the lithic industry reliably. In 1980´s nearly 500 m^2 of Gravettian site were gradually examined by Juraj Bárta in Trenčianske Bohuslavice and briefly published in 1988. In 2007 research of Slovak – Polish – Czech team in Trenčianska Turná and the nearest vicinity was conducted. Short research in Trenčianske Bohuslavice in 2008 and research of Archaeological Institute of Slovak Academy of Sciences (Ľubomíra Kaminská) in Trenčianske Teplice in 2009 can be described as final scientific activities concerning the Palaeolithic settlement of Trenčín Basin.

Since 1960´s surface surveys of local inhabitants were conducted mainly in cadastre of Trenčianska Turná municipality and its neighbourhood. Several collections, at present still kept in private hands are the result of such activities. Part of the assemblages from these surveys is deposited in Trenčín museum now. The lithic knapped industry from surface surveys (i. e. from the stratigrafically unclear position) is generally so characteristic that it allows cultural classification in most cases. The analysis of this assemblages is the major part of the PhD. project of the author of this paper.

At present lithic material from the western part of Trenčianske Stankovce – Trenčianska Turná – Mníchova Lehota microregion is analysed. These results and preliminary results from the rest of this microregion are presented here. Except the intensive Gravettian settlement there are also important sites (some of them stratified) from the Middle Palaeolithic and Early Upper Palaeolithic (*Kaminská et al. 2008*), but they are not the object of this paper.

Complex of 6 sites in the cadastre of Trenčianske Stankovce municipality comes from the Gravettian period and it can be considered as cluster (*sensu Škrdla 2006*). The majority of the surface finds is clearly Gravettian (shouldered points horizon) (*last f.e. Kozłowski 2008*), but at the base of analysis of technology, typology and used raw materials it seems probable that some younger (Late Palaeolithic?) intrusions occur in these collections. From the rest of the microregion we can describe as Gravettian (without more specific classification) also collections from Trenčianska Turná II, Trenčianska Turná V and Mníchova Lehota I. Artifacts from all the above-mentioned sites were made mainly of imported flint and semi-local radiolarite, rarely of hornstones, limnoquartzite or silicified sandstone. The ratio is, of course, different and depends on the particular locality. Other Gravettian sites Trenčianske Bohuslavice (*Bárta 1988, Žaár 2007, Vlačiky et al. 2008*), Zamarovce (*Prošek/Ložek 1954*) and Beckov (*Bárta 1985*) are known mainly from the older literature. The last relevant paper was the article of *Kaminská et al. 2008*, summarizing data from research in 2007 and brief articles of *Michalík*.

Considering the criteria for the „Gravettian landscape“ (valley of the major river, strategic position of sites with the good control of the valley and passes, altitude 200 – 300 m a.s.l.), Trenčín Basin can be assigned to the landscape of the C type (*sensu Svoboda et al. 2002, 21*). Mainly due to the occupation of both banks of the major river (bot none of the sites has the character of the long-term settlement) and similar geomorphology, region of Uherské Hradiště (*Škrdla 2005*) seems to be the most comparable Gravettian region. The distance between both regions is ~50 km.

Hierarchy of settlement units (*sensu Škrdla 2005, 164*):
sites: Trenčianske Bohuslavice, Zamarovce, Beckov, Trenčianska Turná II and V
site-cluster: Trenčianske Stankovce I – VI
settlement microregion: Trenčianske Stankovce – Trenčianska Turná – Mníchova Lehota
settlement area: Trenčín Basin

There are also some local specifics in Gravettian settlement strategy in Trenčín Basin. By comparing with the Moravian sites not so strict orientation to the dominant river can be observed (Trenčianska Turná II and V, Mníchova Lehota I). Protected valleys without the good control of the main valley are settled more often (Trenčianske Bohuslavice, Beckov). Analysing the localization of the sites from the point of view of the relation to some cardinal direction expected preference of the south was not proved. It is probable, that this criterion was not the most important one, comparing with f. e. placement near the most narrow part of basin (similarly *Oliva 2007, 157*). Unlike in Moravia (*Svoboda 1999, 156*), strategic localization of the site is shown in the relation to the control of „dry pass“ (i.e. without the river) - Jastrabie pass (Mníchova Lehota I site), which connects Trenčín Basin with the Bebrava drainage basin and later Nitra drainage basin with stratified Willendorf-Kostenkian site Nitra - Čermáň. So far it seems also notable, that the consequence of too wide range of altitudes (210 – 280 m a.s.l.) is only limited respect of settlement territories of Gravettian and sites from Early Upper Palaeolithic.

Table of the „Palaeolithic landscapes“ (*Svoboda et al. 2002, tab. 7*) has to be applied for Trenčín Basin in modified version. Generally, despite of local specifics geography of Gravettian occupation of Trenčín Basin is similar to the Moravian areas. It keeps the main (dominant river, strategic situation, altitude) and some subsidiary (local streams, landscape dominants) conditions and assumptions of settlement strategy of Moravian Gravettian.

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Tvarožná 1 – a site of the evolved Aurignacian in Moravia

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Three collections of stone artifacts from the Tvarožná I-Za školou site have been described in this poster. First two collections come from the surface research of S. Bajer (825 artifacts) and P. Kos (121 artifacts). Third collection, which consists mainly of tolls and comes from older surface researches, was given to the Anthropos Institute of Moravian Museum by B. Klíma. This selective collection was analyzed separately with the accent on the tool typology.

The results of the raw material analysis can be found in the first part of the poster. Radiolarite, which dominates in all collections from Tvarožná I, is followed by erratic flint and local cherts (among them the Krumlovský les, Stránská skála, Troubky-Zdislavice and Olomučany types were recognized). Spongolithe, quartz and Drahany quartzite appear rarely.

The results of the technological analysis can be found in the second part of the poster. The percentage of blades is quite high (46%), most of tools are made on blades (71%). Cores are usually prismatic assigned for the blade production. Blades are often removed from the narrow edge of the cores. Core burins verge fluently into prismatic cores. Cores with one platform prevail; two platforms cores and multiple platform cores can appear as well. Flat cores are rare. Butts are usually reduced; they are often plain and punctiform. Faceted, corticated and diedric butts are not so usual. Bulbs are usually indistinctive, which could by caused by the use of soft hammer or by the technique of indirect percussion. Number of tools in assemblage is quite high (21%), which points at economization of the imported raw material. This hypothesis can be supported by the high number of combined tools in the collection.

From the typological point of view burins dominate over end scrapers (IG: IB=15:46). The Aurignacian busqed burins, which prevail in the category of burins, are followed by dihedral burins, burins on truncation and by burins on broken blade. Flat end scrapers prevail among end scrapers; the Aurignacian types are not so common. Retouched blades (23%) and combined tools (6%) are also numerous. Side scrapers (2%), notches (2.6%) and so called Kostenki knives (2.1%) are rare. Points, borers, denticulates and Dufour bladelets appear rarely. Generally the collection from Tvarožná I can be classified as the evolved Aurignacien of so called burin facies.

In comparison with other Aurignacian sites in Brno area it seems, that the industry from the Vinohrady – Borky site is the most similar to Tvarožná I. The main difference between these two sites is in used raw material. Radiolarite dominates in Tvarožná I, however the industry from Borky II is made mostly of local chert, erratic flint and spongolithe. Busqed burins are not so numerous in Borky II and the dominance of burins is not so distinctive. Collections from Kohoutovice I and Jundrov are less similar. They contain more radiolarite artifacts, on the other side these industries bear more decadent signs (smaller dimensions of artifacts, carinated end scrapers and busqued burins are less numerous, higher percentage of multiple burins on truncation, dihedral and transversal burins).

Chronological schema of the Aurignacian in the Brno area based on the technological and typological analyses was elaborated for this poster. In the frame of this schema five chronological periods were established: Early Aurignacian (Maloměřice-Občiny), Middle Aurignacian (Stránská skála IIa, layer 4), Upper Aurignacian (Stránská skála IIa/3), Late Aurignacian (Tvarožná I) and Epi-Aurignacian (Kohoutovice I). The Tvarožná I site dates back to the Late (evolved) Aurignacian. There is a lack of stratified sites for this period, however on the base of indirect proofs it can be dated back to the time after 28ky BP.

Tvarožná I site was long term hunter camp with various different activities carried out on the spot. The most common tool type – the Aurignacian busqed burin – must have been used in many different functions. The dominance of the radiolarite in the collection can be explained by the connections of the Tvarožná I hunter group to the area of the outcrops of this raw material in the White Carpathians. The hunters might have come to the Brno area from this region.

Environment and climate changes during OIS 3 and OIS 2 in Moravia and Slovakia on the base of stable isotopes

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OIS 3 and OIS 2 period was characterized by significant climatic oscillations and environmental restructuring. Climate development is documented by changes of sedimentary overlay, on which directly reacted communities of the flora, fauna and humans. Living organisms had to adapt to hard climatic conditions and rapid paleoenvironmental changes. These climatic and environmental changes were studied by the diverse methods up to the present.

In this research we provide paleotemperature, paleodiet and paleoenvironment reconstructions during the OIS 3 and OIS 2 period on the basis of oxygen and carbon isotope analyses of mammoth tusk dentine, horse and reindeer tooth enamel.
The samples for the research comes from the *Mammuthus primigenius* tusks (Slovak Republic: Trenčianske Bohuslavice 30 053 ± 258 cal. BP, Dzeravá skala cave 27 793 cal. BP; Czech Republic: Kůlna cave 27 568 ± 445 cal. BP., Brno – Vídeňská street 17 588 ± 257 cal. BP, Pekárna cave 15 701 ± 662 cal. BP.); from tooth enamel of *Equus* sp. (Czech Republic: Balcarka cave 32 752 ± 322 cal. BP., Balcarka cave 17 186 +-223 cal. BP, Býčí skála cave 15 652 ± 336 cal. BP, Pekárna cave 15 701 ± 662 cal. BP, Kolíbky cave 15 053 ± 339 cal. BP) and from tooth enamel of *Rangifer tarandus* (Czech Republic: Balcarka cave 32 752 ± 322 cal. BP).

For determination of $^{13}C/^{12}C$ and $^{18}O/^{16}O$ ratios we used the methodology after McCrea (1950). All analyses were performed at Czech Geological Survey (Prague, Czech Republic).
Drinking water $\delta^{18}O_w$ values of approximately -12,8 ‰ to -7,8 ‰ were calculated from oxygen isotope compositions of *Mammuthus primigenius* tusk dentine, *Equus* sp. and *Rangifer tarandus* enamel using species-specific calibrations for modern elephants, horses and reindeers. Using the $\delta^{18}O_w$ precipitation-air temperature relation, air paleotemperature can be calculated. Calculated paleotemperature for the Gravettian reached around 5,9 ℃ to 10,56 ℃, for the Magdalenian around 2,7 ℃ to 7,4 ℃.

The range of $\delta^{13}C$ in the *Mammuthus primigenius* tusk samples from Gravettian varied from -10,8 ‰ to – 8,3 ‰; $\delta^{13}C$ in the *Equus* sp. enamel varied from -9,7 ‰ to -9,3 ‰ and $\delta^{13}C$ in the *Rangifer tarandus* enamel varied from -8,1 ‰ to –7,2 ‰.

The range of $\delta^{13}C$ in the *Mammuthus primigenius* tusk samples from Magdalenian varied from -10,5 ‰ to – 9,7 ‰ and $\delta^{13}C$ in the *Equus* sp. enamel varied from -10,7 ‰ to -7,6 ‰.
Calculated mean paleotemperature during the Gravettian (around 5,9 ℃ to 10,56 ℃) and Magdalenian (around 2,7 ℃ to 7,4 ℃) on the base o f $\delta^{18}O_p$ from mammoth tusks, horse and reindeer teeth enamel represents most likely average paleotemperature of the estival months in the time period of cold events during OIS 3 and OIS 2.

The environment during the Gravettian had the character of steppe and meadow, in some cases with light woodlands along rivers on the base of our isotope analyses. This conclusion could be confirmed by sympatric occurrence of typical large grazing animals such as

Mammuthus primigenius, *Rangifer tarandus, Equus* sp., *Bos/Bison* sp. or *Coelodonta antiquitatis* in the localities studied. Our analyses support a mosaic character for the Gravettian paleoenvironment.

Environment during Magdalenian could be interpreted as gradual transition from open grasslands to more closed on the base of carbon isotope analyses. Our results confirm also alternating of colder and warmer oscillations. Differences in paleoemperature and paleovegetation in the same time could be explained by changes of the climate (climatic oscillations), by migration of the animals or by different age of the samples.

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"Taubachian and Micoquian Retouchers from Kůlna Cave, Czech Republic"

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The grant project GAČR 404/07/0856 was focused on the research of the fragmented hard animal materials that show traces of human manipulation. We distinguished retouches with clear marks of lithic tool production. They are relatively abundant in both Micoquian and Taubachian layers in Kůlna Cave.

Both assemblages are very similar from the technological point of view. Neanderthals usually used fragmented bones (rest of subsistence processes); Micoqiuan assemblage contains also parts of mammoth tusks.

Taubachian Neanderthals preferred bones of the big body animals like horse although rests of middle body animals (reindeer) prevail. Micoquian people used mainly middle body animals and therefore the average dimension and weight is less then in Taubachian. New feature of Micoquian Neanderthal behaviour is using of retouches from rests of big game fauna. Especially mammoth was determined and it shows different method of mammoth body processing because both tooth and long bones were used.

Surprisingly we found only one statistically significant difference between Taubachian and Micoquian retouches. Traseological analysis of impact striation divided long and narrow traces of Micoquian and short and wide ones on the Taubachian pieces. Also orientation of traces is a little bit different.

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„GIS Reconstruction of Taubachian and Micoquian Spatial Distribution in Kůlna Cave (Czech Republic)“

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The archaeological material from Kůlna Cave has been investigated by various analyses many times. Some of them have indicated the need to carry out reconstruction of cave spatial distribution focusing on ways of cave use. Having such knowledge, we could also explain more precisely a function of the settlement unit as we proved that not all archaeological layers represent traces of human activity with the same purpose. The system of spatial documentation, done during the cave research, made it difficult to analyze the cave spatial distribution with conventional methods. Only GIS methods of spatial simulation brought relevant and evident visualization. It was obvious the cave purpose had changed in time probably concurrently with the change of site function. Besides simple structures classified as the Taubachian in Kůlna Cave, we can also describe complex use of the inner space during the Micoquian settlement.

The presented scheme of spatial distribution of Kůlna Cave opens an important question about the mechanism of formation of archaeological concentrations. Mostly we suppose that preserved structures represent palimpsest of multiple settlement mainly in cases where findings are widely deposited in thick sediments. Generally we incline to this opinion also in the case of the analysed site.

Described structures bear interesting features which do not correspond to the theory too much. Calculated concentrations are spatially defined quite precisely (in spite of the fact we had to eliminate the original way of localization with less detailed resolution) and they are also clearly bordered. In case of repeated visits or negative animal impact (bear activity) we would expect the findings to be more or less evenly distributed.

Considering mentioned facts, described spatial structures might result from one-time activity or intervals among Neanderthal visits of the cave were short. It was probably the same group of people. The theory corresponds well to the analysis of the Micoquian population mobility in Kůlna Cave which we based on comparison of distribution models of stone raw material for all Middle Palaeolithic layers. The activity range of the Micoquian community turned out to be much lower than the one of the Taubachian. The area of stone raw material acquisition has the radius of approximately 50 km.

There is another interesting fact. The Neanderthals use almost all spots within both layers 7a and 6a. Thus we must consider the possibility that suitable configuration of certain parts of Kůlna Cave could influence decision-making process of two different Neanderthal communities in a way they both used the same areas.
The applied methodology allows to reconstruct with modern methods even older archaeological situations which do not meet our current requirements for the quality of obtained data. If the findings are documented, at least, in a square net, we are able to obtain relatively precise results while using the presented model. To get further and more detailed analysis, we need to perform reffitings of stone industry and to find out mutual relations among accumulations. It will be certainly interesting to see how joining lines would coincide

and if they connect concentration of different expected functions. At the same time it will be advisable to incorporate distribution of all osteological artefact into structures. We will have to use taphonomic analyses to reduce possible effects of natural bone deposition as much as possible. They are related to predator activities in caves.

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Middle Danube Region During the Stage 3 – Cultural Implications

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During last several decades new excavations and research programs have yielded new evidence for the recontruction of Middle to Upper Palaeolithic transition in Moravia and consequently on wider area of Middle Danube. A codification of lower phase of the Szeletian in Moravia was possible by excavation of a new open-air Palaeolithic site of Moravský Krumlov IV, where four Palaeolithic horizons have been documented, including the Szeletian layer 0. A possible relation between both Szeletian and Micoquian was tested also by grant project focused on the analysis of shapes of leaf-points from different sites and cultures. Chrono-stratigraphic position of both Bohunician and Aurignacian i Moravia has been done by excavations of sites such as Brno-Bohunice, Brno-Stránská skála, Tvarožná, Vedrovice Ia or Aurignacian sites in Napajedla Gate and by dating of human fossils from Mladeč Caves. New results are interesting in the context of Middle Danube region where Willendorf II, Dzeravá skala or Hungarian EUP sites are newly analysed.

Comparison of published data enables to construct updated model of Middle to Upper Palaeolithic transition. Proposed theory understands Szeletian as manifestation of Micoquian during the EUP period. There is no evidence of acculturation both Micoquian and Szeletian by AMH. Such relation we supposed after 35 kyr uncal BP when the spread of AMH to Moravia (with Aurignacian cultures) is indicated by increasing of sites and by published absolute data.

The Settlement Strategies in the Krumlov Forest region (South Moravia, Czech Republic) during OIS 3 Stage

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The Krumlov Forest region is situated 40 km SW of Brno city and is well known for occurrences of raw material and the extraction of the particular type of chert named after it (Přichystal 1984; 2009). The terrain is very hilly, with an axis running SSW-NNE. The majority of the Palaeolithic sites are concentrated on the eastern slopes, divided by a series of valleys. Currently over 130 sites are known, but to this time only 4 of them have been excavated (Vedrovice V, Vedrovice Ia, Moravský Krumlov IV and Maršovice). It means that, the majority of the Palaeolithic sites, is known from surface finds, and those are without an absolute dating (generally the sites are ranked between the Lower and Upper Palaeolithic). Recently the Palaeolithic settlement strategy was investigated in the Krumlov Forest region from the statistical point of view (Nerudová 2008). The factors of interest were site location within the terrain geomorphology (absolute JTSK coordinates, elevation above the see level, site orientation, distance and elevation regarding the water streams) and their character (raw materials used, station size, number of lithic industry pieces, age). Collected data were processed by statistical methods. The Micoquian has a clean-cut settlement strategy especially in comparison to other Middle Palaeolithic sites in the area of Krumlov Forest; it was situated at higher altitudes, and relatively high and far from water sources. MIcoquians evidently preferred a strategic location in the countryside.

During the Early Upper Palaelithic the number of the sites increases significantly, especially dated to the Szeletian period, less to the Aurignacian. The Bohunician is represented by only two stations, but they are comparable to other Bohunician sites known from the Brno basin. The distinctive features include their location on a distinct rise high above a water course. The Krumlov Forest chert raw material composition is different.
The Szeletian sites are concentrated especially on the eastern slopes of Krumlov Forest. Their size and distribution in the landscape suggests a structure with a big site (e.g. Vedrovice V, Jezeřany IIa) surrounded by small, maybe hunting stations. Regarding other cultures, comparable settlement strategies are the Szeletian with the Middle Palaeolithic (Micoquian).

There is an obvious and clean-cut settlement strategy in the Late Palaeolithic sites, which are situated at lower altitudes and a low elevation with respect to small water streams. The collections consist of a rather small number of industries with considerable presence of rock crystal. Although the density of yet age-unspecified sites is very high, we suppose there will be possible to determine their chronological position on the basis of GIS analyses.

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New research on the chronostratigraphy of the Early Upper Palaeolithic in Central Europe: excavations in Willendorf II, Austria (2006 - 2009)

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In 2006 we started new excavations at Willendorf II, a site originally excavated between 1908 and 1955. The site's deposits cover the time period of > 55.000 to 23.000 years uncal. BP and include 9 archaeological layers separated by sterile loess. The early levels from Willendorf II play a key role in the discussion of the dispersal of modern humans into Europe and of the origin(s), dating and dispersal of the Aurignacian. In recent years, however, the evidence has been debated both for the 14C dates and for the cultural attribution of the Early Upper Palaeolithic (EUP) assemblages.

Our new work at the site is aimed at clarifying these issues and at placing the EUP occupations in their climatic and environmental context. For this, samples covering the entire stratigraphic sequence are being collected from the site's main section. Special attention is being paid to better understanding the site formation processes, collecting dating samples (large dating program: C14-AMS on bone and charcoal, OSL and TL), expanding the EUP lithics sample, and obtaining malacology samples for environment reconstruction. We further collected abundant samples for palaeomagnetic, tephrachronological and pollen analyses.

Here we present the results to date, reassess the known sequence and discuss our findings in the context of the Middle to Upper Palaeolithic transition in Central Europe. A special focus is put on the implications of our findings for the chronostratigraphy of the OIS 3.

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Aurignacian and Gravettian occupations in Eastern Europe between 33.000 and 23.000 BP

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The Early Upper Palaeolithic in the East of the Carpathians mountains is known since the 19th century. Through the years important sites have yielded numerous data concerning the Aurignacian and the Gravettian. Today, it is possible to reconstruct the evolution of these techno-complexes through time, mainly with the Molodova V and Mitoc-Malu Galben sequences. This reconstruction show that: (1) the two techno-complexes are contemporaneous at about 30.000 BP; (2) the Gravettian emerge at a very early stage in the area, like in Central Europe; (3) it is followed by a hiatus before the more consistent Gravettian occupations at about 26,500 BP; (4) shouldered points occur in the area but probably without being part of the so-called 'Kostenki-Willendorf ' culture; and (5) the Gravettian occupations are very scarce after 23,000-22,000 BP and until the re-emergence of the backed pieces tradition with the Epigravettian at about 20,000 BP.

Seasonality of Gravettian sites based on study of mammal's dental cement microstructures

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Seasonal or perennial occupancy of the prominent Central European Gravettian localities could be studied using the animal dental cement microstructures. The use of this method enables also to assess the accurate age and death season assessment of the animal death and allows to find out not only the palaeoecological conditions of archaeological situation, but also to introspect the economical-social relationships of the hunting-gatherer cultures. Hunting and settlement strategies, i.e. when and why the specific site was settled, can also be traced using the known animal death season.
According our results sites like Dolní Věstonice, Přerov – Předmostí, Moravany –Lopata II and Krems Gravettian were settled all the year round on the basis of the hunted animal teeth microstructures. The sites Jarošov, Spytihněv, Lubná I, Trenčianské Bohuslavice, Grub/Kranawetberg-Stielfried and Krakow-Spadzista were on the other hand occupied only seasonally (spring-autumn). Sites with more difficult interpretations are Polish cave sites (Deszczowa and Mamutowa cave); it is necessary to study more material to prove the perennial occupancy of Gravettian hunters in caves.

Recent data from OIS 3 in Belgium: loess and cave records

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Despite abundant sites and numerous archaeological excavations, the knowledge of Belgian cave entrance and rock-shelter sequences is still poor from geological, palaeoecological and chronostratigraphic points of view. A systematic program of detailed stratigraphic recordings associated with different palaeoenvironmental analyses and datings has recently been undertaken in close collaboration with researchers from different disciplines. The objective was to better understand the sedimentary dynamics of these fillings and to test their potential as recorders of Quaternary climatic variations. The specificity of the geological background, including the presence of a thick loess cover in Belgium and the proximity of the Eifel volcanic fields, plays here a major role, placing Belgium in a highly favourable position.

The microstratigraphic records and the multi-proxy study of the Walou Cave sequence illustrate this approach. The pedosedimentary approach identified several clear climatic signals. The validity of these signals was confirmed by palynology, anthracology, study of small and large mammals and magnetic susceptibility. The palaeobotanical data helped specify the types of vegetation characteristic of the different stages of the filling process. Furthermore, tephrostratigraphy together with the excellent correlation with the loess sequences of Middle Belgium gave this exceptional recording a coherent chronostratigraphic context, supported by radiocarbon, thermoluminescence and ESR/U-Th dates. The sedimentary and palaeoecological records of Walou ranges from the Holocene down to the Pre-Wechselian and includes the Late-Glacial, Pleni-Glacial, Early-Glacial and probably Eemian. Walou cave presents the most complete and best documented Upper Pleistocene sequence available for all the Belgian caves. It is therefore a key site for the understanding of OIS 3 in Belgium. Several Middle Palaeolithic occurrences - one being associated with an isolated Neanderthal tooth - as well as an Aurignacian assemblage are coming from the OIS 3 part of the sequence.

Other results recently obtained on OIS 3 from some other Belgian cave sites (mainly Scladina cave) will also be presented, together with a synthesis of the regional loess reference sequence for OIS 3. These results lead to interesting prospects for research work in Belgian cave sites. Accurate interpretations of sedimentary dynamics, palaeoenvironment and chronostratigraphy will lead to interesting applications for other disciplines involved in the study of these types of deposits, particularly archaeology, palaeoanthropology and palaeontology. Moreover, the presence of loess in the geological background allows correlations with the reference sequence elaborated from loess sections of Central Europe (Haesaerts et al., this conference).

“Investigating climate at the site of Krakow-Spadzista using oxygen isotopes"

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Kraków-Spadzista is a comparatively rare example of a large Upper Palaeolithic site dated between 20-30kya and located on the North European Plain. Famous for the large accumulation of mammoth bones found there (MNI 86 animals), Kraków-Spadzista represents a crucial example of human activity north of the Trans-European mountain chain during this period. It demonstrates that humans were active in this northern zone during the period leading into the LGM, known to be the coldest phase of the last ice age.

This study reports the results of a climatic investigation at Spadzista using oxygen isotopes recovered from mammoth tooth remains found at the site. Oxygen isotopes are well known as an indicator of temperature changes from the studies conducted on ice and marine cores, and faunal remains provide an important resource for studies in terrestrial environments at Palaeolithic sites. In faunal remains, the oxygen isotopic signal reflects the composition of the water consumed by mammals as their teeth were growing, and can be related to the average temperature during this time. It therefore provides a snapshot of climate averaged over a period of c. 1-3 years, and can be recovered from faunal material now preserved in archaeological collections.

Ten mammoth teeth and ten mammoth bones were sampled for isotope analysis from the Kraków-Spadzista collections. This poster will present the results of this analysis, and discuss them in the context of other climatic and isotopic research in the Upper Palaeolithic of Central Europe.

East European archaeological and geological sequences at MIS 3: Kostenki model.

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Despite of increasing amount of methods related to chronological problems, multilayer sites remain to be the most reliable base for the chronological correlations. Principal meaning for East European Upper Palaeolithic have two cultural-stratigraphic sequences: Molodovo and Kostenki.

If the first remains to be immutable from 1950-60s and recent update by P.Haesaerts provided additional evidences for unilinear cultural evolution, multilinear Kostenki model has been under construction until now and remains to be incomplete, because it bases on number of sites, sections of which are used as a compliment one another.

In its classical form the Kostenki model was first developed in 1950-60s by A.N. Rogachev in cooperation with G.I. Lazukov and A.A. Velichko. It was a tripartite sequence based on the triple subdivision of the sedimentary formation. Sites of the late (III) chronological group were related to the loess-like silts of the colluvial mantle on the II and Ist river terraces. The middle (II) and ancient (I) groups were associated with two humic beds separated by volcanic ash. Their chronological brackets were established as 36-33 kyr for ancient; 32-27 kyr for middle, and 23-20 kyr for the recent groups according to the series of radiocarbon dates provided in 1980s by joint efforts of N.D. Praslov and L.D. Sulerzhitsky. Sites of the Last Glacial Maximum according to this model were absent at Kostenki due to the lack of a sedimentary record for that time.

Due to excavation of 1998-2007 at Kostenki 14 (Markina Gora), the site became to be a key section both for geological and cultural sequences of the region with the complete series of 9 cultural layers relating to the late MIS 3 - early MIS 2, or in geochronometric terms – to 44(?)-22 kyr interval. The section appears to be one of the best equipped by analytic data: there are 2 pollen diagrams plus a series of more than 60 radiocarbon and 40 OSL-IRSL dates counted in different laboratories. Of particular significance are the chronologic markers of high temporal resolution. These are layer of the volcanic ash connected with Campanian Ignimbrite (CI) eruption at the Phlegraean Fields Caldera in southern Italy dated to 39-41 calendar kyr, and paleaeomagnetic excursion Lachamp-Kargopolovo (~42 kyr) related to the sediments of a fossil soil beneath the tephra layer. Cultural layer of Aurignacian attribution with radiocarbon dates of 32 kyr (~37 cal) in the volcanic ash, and cultural layer provided a new before unknown cultural tradition with radiocarbon series of 36-37 kyr (41-42 cal) in the sediments under the fossil soil with paleaeomagnetic excursion are the background for the formation of two time scales: "short" radiocarbon and "long" based on a series of other chronological methods.

Perspectives in the clearing of the situation appeared after the new 14C date of 35 kyr for the cultural layer in volcanic ash with ABox treatment (OxA), which calibrated provides 40 kyr in good relation to the age of CI eruption. Archaeological assemblages of 8 cultural layers and 3 palaeontological without cultural associations at Markina gora provide new evidences for the modification of Kostenki' model both as number of lines of cultural evolutions and as a series of sharp changes and external intrusions.

New Data on Hominin Occupations in the Brno Basin during OIS 3

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The Early Upper Paleolithic (EUP) and the problem of the replacement of Neanderthals by anatomically modern humans is a crucial question in current archeology and anthropology. Over the last few years we have been surveying within and beyond the Brno Basin for new stratified EUP sites in order to enhance our knowledge of the homogeneity of lithic assemblages as well as the chronostratigraphic context of the EUP occupation in the area.

Within the frame of our EUP project, we have built a team consisting of archaeologists, geologists and dating specialists in order to pursue a combined approach in the study of the EUP (Richter et al. 2009; Škrdla et al. 2009). Apart from detailed lithic analyses (including raw material, typological, attribute, and refitting analyses) and spatial analyses of the finds, the team has also performed some of the first archaeologically-aimed micromorphological analyses of these EUP sites, along with the application of a new generation of dating techniques (TL and OSL). Together, this is a new approach to the EUP question in our region. The combined-arms approach of improved geology and improved dating should increase our understanding of the meaning of the "geological contemporaneity" of the Bohunician and the Szeletian in archaeological or behavioral terms, as well as helping to solidify the temporal and geological differences with the Aurignacian.

We present preliminary results from the following sites currently under excavation by our team.

Tvarožná-Za školou – a Bohunician site located 7 km to the east of the Brno Basin on a hypothetical line connecting Brno Basin through Vyškov Gate to Upper Morava River Valley and further to the north. The site was the subject of excavation in 2008 (Škrdla et al. 2009). With the geological analyses completed, we will continue the excavation in order to recover more artifacts for analysis and dateable material (burnt flint for TL).

Líšeň-Čtvrtě – an Aurignacian site located on the elevation bordering the Brno Basin to the east. The site has been known for a long time as a Bohunician surface site with Aurignacian and Magdalenian intrusions (Škrdla 2000 with ref.). However, in 2009 a limited scale excavation located on an eastern margin of the surveyed area documented Aurignacian artifacts, osteological remains and scattered charcoals within intact calcareous sediments. The archaeological and geological analyses are in progress.

Želešice-Hoynerhügel – a Szeletian (?) site located in the Bobrava River Valley nearby to Brno Basin was for a long time known as surface site (Valoch 1956). Recently, in the frame of a current survey project, the site was intensively surveyed and a series of test pits dug on the site yielding artifacts together with scattered charcoal within intact calcareous sediments. The site will be the target of geological study and an archaeological excavation during the summer of 2010

Želeč-Holcase (Ondratice I) – the EUP (Bohunican?-Szeletian?) site is located at the foot of the Drahany Upland on the margin of a natural corridor connecting the Brno Basin through the Vyškov Gate to the Upper Morava River Valley. The site was excavated by Schwabedissen (1942), however all subsequent attempts to find artifacts within intact sediments yielded negative results (Svoboda 1980). Recently, in the frame of a current survey project, the site was intensively surveyed and a series of test pits dug on the site yielding artifacts together with scattered charcoal within intact calcareous sediments. The site will be the target of an archaeological excavation during the summer of 2010.

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Isotopic investigations of climate and seasonality during the Moravian Gravettian

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The Upper Palaeolithic in the Central European Plains was a critical period in human evolution marked by technological developments in lithic industries, extensive production of figurative and non-figurative art, the increased use of non-local raw materials, and the earliest development of ceramics and textiles. These developments took place during oxygen isotope stage 3 when rapid, large magnitude oscillations of climate known as Dansgaard-Oeschger (D-O) events occurred in Europe. Their effects have been noted in marine and terrestrial environmental proxies throughout the region. It is generally accepted that the climate was a critical factor for humans during this period, but we have little understanding of precisely how the climatic context affected hominin populations in central Europe. A crucial first-step in exploring this issue is to gain a better understanding of the climates and environments experienced by humans as they lived at and formed the archaeological sites known to archeologists today. Such information may potentially allow sites to be related to D-O events, regional climate records and longer-term, high-resolution sequences such as the Greenland ice cores.

To further investigate climate at Moravian Gravettian sites, we conducted isotopic analyses on material from sites located across the Pavlovske Hills. This centered on applying oxygen isotope analysis to animal teeth of three species: fox, horse and mammoth. Oxygen isotopes provide a proxy for climatic changes in the past, and provide a basis for making comparisons between sites. Bulk samples were collected from horse and mammoth teeth, which approximate to an annual average signal. Bulk fox tooth samples, and intra-tooth samples of horse teeth were also collected to investigate aspects of seasonality. By combining the isotopic signals produced, inferences about the climate and temperature at the time the sites were occupied were made. This approach was supported by isotopic studies of carbon and nitrogen in the bones of horse, reindeer, hare and mammoth. This provides more general information about the ecosystem and environments at the time the animals were alive. Isotopic variation between the sites in the Pavlovske Hills will be presented and discussed in the light of the other environmental and archaeological information available for these Pavlovian occupations.

**Microstratigraphies in the Gravettian settlements:
Chronological stages or occupation episodes?**

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Traditionally, Willendorf II is considered as the key record of human occupations and reoccupations in the Middle Danube region during the OIS3.

Recent field research at a number of other Gravettian settlements (Předmostí, Dolní Věstonice - Pavlov, Petřkovice...) reveals new C14-dated microstratigraphies that help to better document the chronology of individual stages, substages, or episodes of human occupation during this period. In order to approach the nature of these formative processes at the individual sites, the paper evaluates the role of both natural deposition and human activities.

Missing link? Problem of distinguishing OIS 3 sediments in Polish caves

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The Oxygen Isotope Stage 3 covers a substantial part of the last glaciation. Most of the scientific attention is focused on its ending part, connected with the Upper Palaeolithic revolution and a replacement of the Neanderthals by the anatomically modern humans. However, its beginning, which follows the first glacial maximum seems to be also an important period from environmental and cultural perspective. During the OIS 4, rich and developing Neanderthal culture was heavily affected by an environmental stress, which caused probably a serious depopulation of the northern Europe. In the beginning of the OIS 3 (60-50 Kya) the partial re-colonisation of the depopulated land took place. This phenomenon has much in common with a post OIS2 re-colonisation, although is much less researched. Among different research questions concerning that topic, three seem to be particularly important for the reconstruction of late Neanderthal settlement in central and northern Europe:

1.Reconstruction of the climatic and environmental background for Neanderthal settlement
2. Distinguishing the northern border of that settlement
3. Tracing the cultural changes, which occurred after OIS4 cultural and population bottleneck.

As far as the research in Polish Jura are concerned, addressing these questions encounters basic difficulty, as virtually all the traces of Middle Palaeolithic settlement are dated here to the OIS 5 or older. All the presumable OIS 3 archaeological finds are attributed to the very end of that stage, connected already with the Upper Palaeolithic period. Therefore, basic research goal in this case must be to answer the question whether the Polish Jura in the early OIS 3 was located inside the range of Neanderthal settlement. If so, what environmental or methodological factors are responsible for a false impression of missing the link in the geo-archaeological sequence. If not – what environmental factors are responsible for preventing the Neanderthal culture – highly adopted for severe conditions – from exploring these parts of the Central Europe.

This contribution sum up the existing knowledge, based on classical cave research, juxtaposed with the results of multidisciplinary research in Komarowa and Stajnia caves, excavated by the authors during the last decade. For the comparative purposes some undoubted Middle Palaeolithic OIS 3 sites from Central Europe are also discussed.

The study concerns the palaeoenvironmental reconstruction of the analysed region, intended to distinguish factors affecting potential Neanderthal settlement. It discusses also the main methodological problems potentially responsible for the difficulties in distinguishing the OIS3 sediments and proper attribution of archaeological finds in case of Central European cave sites. Special attention is paid to some Middle Palaeolithic innovations in flint tool production technology, which may have a chronological value increasing our ability to properly attribute the finds.

Interdisciplinary research of Gravettian site Trenčianske Bohuslavice – Pod Tureckom (Slovak Republic) in 2008

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Trenčianske Bohuslavice municipality is located in the middle course and on the right bank of the river Váh, several kilometres NNE from the centre of Nové Mesto nad Váhom, at the entrance of the Bošácka valley. The site is situated W from the village on the right bank terrace of the Bošáčka brook which is covered by loess. The first systematic archaeological research here was realized by J. Bárta (Archaeological Institute of Slovak Academy of Sciences) in the years 1981 – 1986, in which 478 m^2 of the site was studied (Bárta, 1988).

During the investigation of J. Bárta the research area was divided into three workplaces – A, B and C. On the most extensive workplace, workplace A, there were 32 trenches gradually dug out. Both findings of the lithic industry and the results of the radiocarbon dating placed the site into the Willendorf-Kostenkian (Verpoorte, 2002; Svoboda, 2006; Žaár, 2007). The radiocarbon dates from this research range from around 25 500 to 22 500 years BP (Verpoorte, 2002; Žaár, 2007). Faunal findings were marked only by the trench number and the depth under the surface, but not in every case. J. Bárta did not use wet-sieving of the dug-out sediment, so majority of small finds remained undiscovered.

The first short information about rich palaeontological material of hunting game and the results of evaluation of malacofauna from J. Bárta's research in Trenčianske Bohuslavice were published by Holec & Kernátsová in the year 1996. More detailed studies of the material of selected mammal species from this locality were made by Karol (2005), Pošvancová (2005) and Vlačiky (2005). Human modifications mainly on the reindeer and mammoth bones were published by Vlačiky (2008 a, b). The same author also interpreted a vast concentration of faunal remains situated in trenches 19/83, 24/83-84, 25/84, 26/84-85 and 31/86 as bone dump.
The small (2 m^2 large) revisory research in 2008 (Vlačiky et al., 2008; 2009) was focused on answering the question of mutual position of the separate cultural horizons and correlating them with the layers whose mutual position was uncertain when described by Bárta (1988). During this investigation, samples of bones for isotopic and genetic analyses and samples of sediment for sedimentological, pollen and malacofaunal analyses were taken. In 2008 three occupational levels in superposition were discovered: in the depth of 25-35 cm (upper occupational layer), 55-75 cm (middle occupational layer) and of 85 – 125 cm (lower occupational layer). The layers have been already radiocarbon-dated in the Centre for Isotope Research at the University of Groningen. The upper layer provided date 22 330 +/- 110 uncal. years BP, the middle 23 210 +/- 100 uncal. years BP and the lower occupational layer 24 540 +/- 130 uncal. years BP (Vlačiky, in press). Every finding from the new research was three-dimensionally oriented in the relative coordinate system and the whole dug-out sediment was wet-sieved through a mesh with 2 mm large openings to collect even the smallest findings (Vlačiky et al., 2008; 2009).

Truncated blade made of red-brown radiolarite was the only tool from the upper layer. In the middle layer we have found among other flakes and blades also a dihedral burin on a bilaterally retouched blade and a retouched blade end-scraper in combination with burin. There was also a backed bladelet found during the wet-sieving. All the mentioned tools from the middle layer were made of flint. Lower layer was the richest in terms of industry and also the only layer with fossil remains of hunted game. Five retouched blades or their fragments; fragment of the pointed retouched blade, four backed bladelets, two burins (dihedral and on the broken blade) and 13 extra backed bladelets or their fragments (i. e. from the wet-sieving); came from this layer.

The hunted game from the Gravettian site in Trenčianske Bohuslavice – Pod Tureckom, from Bárta's and our new research together, belonged to the following species and genera: *Rangifer tarandus* (reindeer), *Equus germanicus* (horse), *Mammuthus primigenius* (mammoth), *Vulpes lagopus* (polar fox), *Bos*/*Bison* sp. (aurochs/steppe wisent), *Ursus arctos* (brown bear), *Canis lupus* (wolf), *Castor fiber* (beaver), *Coelodonta antiquitatis* (woolly rhinoceros), *Lepus* sp. (hare) and *Cervus elaphus* (red deer). Based on the number of bones and teeth found, the reindeer's ones dominated, followed by the horse's and those of the mammoth and polar fox. Other mammal species were rare (Vlačiky, in press).

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Microtephra and the European Middle/Upper Palaeolithic – First report from the RESET project

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This research forms part of the RESET project (RESponse of humans to abrupt Environmental Transitions), a 5-year UK Natural Environment Research Council (NERC) funded consortium which began in January 2008 (http://c14.arch.ox.ac.uk/reset/). Our aim is to use microtephra layers (i.e. distal ash falls from past volcanic eruptions) to better correlate European and circum-Mediterranean geological and archaeological events over the last 60,000-25,000 years. One of the most interesting aspects of this research is the investigation of late Middle and early Upper Palaeolithic sites for evidence of distal tephra stratigraphic markers of known provenience and age, and integrating these datasets with key palaeoclimate records.

The study of tephra layers in high-resolution stratigraphic contexts can provide both independently dated, site-specific marker horizons and a means of correlating diverse archaeological, environmental and climatic archives. This technique is particularly relevant to questions related to 'transitional industries' among late Neanderthal and early Anatomically Modern Human populations, as a number of large volcanic eruptions and their associated distal tephra fallout are known to have occurred across parts of Europe and the circum-Mediterranean during this critical time period. Furthermore, given the limitations of radiocarbon dating beyond c. 40 ka BP and the current uncertainties of calibration curves at this time-scale, tephrochronology is a potentially unique tool for deciphering isochronous or 'event' stratigraphy in numerous geological and archaeological records. Thus a further goal of this research is to improve both the precision at which we can examine the chronology and environmental context of Middle/Upper Palaeolithic industries in Europe and our understanding of how humans may have responded to rapid climate change in prehistory.

To date, our research group's on-going study of microtephra has conducted high-resolution sediment sampling at eight sites geographically spread across western and central Europe for detailed laboratory processing and chemical analyses. Each of the study sites preserve radiocarbon dated stratigraphic sequences spanning much of the late Middle and early Upper Palaeolithic periods. These include Cueva Antón in the Murcia region of southeast Spain; L'Arbreda in Catalunya Spain; Grotte Mandrin in the Rhoňe Valley of southern France; Les Cottés in the Seuil du Poitou region of west-central France; Kozarnika Cave in the northern Bulgarian foothills of the Western Balkan Range; Theopetra Cave on the northern Thessaly Plain in central Greece, and the southern Peloponnese sites of Klissoura 1 in the foothills of the northern Argive Plain and Lakonis I on the Mani peninsula. Preliminary results from these investigations will be presented and evaluated within the wider framework of

European Middle/Upper Palaeolithic tephra research. Preliminary conclusions are discussed in the context of RESET's broader microtephra sampling program in central and eastern Europe in 2010-2012.

Weichselian Landscape and Middle Palaeolithic settlement within the Odra Valley: new evidence from Hallera Avenue in Wrocław (SW Poland)

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The Odra River Valley is one of the most important corridors for hominids migrations, linking the Carpathian area with the Central European lowlands. Therefore during the older period of Weichselian (OIS5-3), the middle part of the valley became the subject of intensive exploitation by the last archaic humans, the Neanderthals. Owing to the fact, that until recently we have had only small collections of well-dated settlement remains rarely preserved in high-energy riverine environment, the age of settlement episodes, the type of geocomplexes and subsistence strategies of Neanderthal remained uncertain.

The long-term excavation of the archeological site (ca. 800 m2) conducted by the University of Wroclaw at Haller Avenue in Wrocław (SW Poland), has increased our knowledge in this subject. In this presentation, we will report preliminary results, including: models of the site formation processes, details on environmental conditions and remarks on chronological framework and character of Neanderthal's settlement.

The site is situated on the border of the Wrocław Ice Marginal Valley and the Wrocław Plain. It is localised on a hump elevated ca. 12 – 15 m above the present water level of the Odra River. The core of this prominence is build from middle Pleistocene sediments, however its surface was reformed due to the development of fluvial and periglacial processes during the Weichselian glaciation (5-3 OIS). The hump was a dry and accessible bridge allowing relocation of hominids and fauna along the Odra valley during the Upper Pleistocene. Moreover, this hump abundant in erratic flint moraine sediments was a raw material supply area for tools manufacturing. Therefore the older stage of human activity is represented by several thousands of flint artefacts and faunal remains accumulated in fluviatile sediments.
The riverine deposits could be divided into three complexes A, B and C. Complex A and B are connected with older stage of settlement, while C with younger one. Complex A consists of stone boulder pavement derived during erosion of moraine till; B – alluvial gravel-sands sediments deposited by the braided river; C – sands and gravels accumulated by ephemeral, low–energy braided river. The artefacts and bones from A and B complexes were slightly redeposited due to fluvial activity, however represent good state of preservation and accumulated in relatively large amount build the refittings. The artefacts from complex C are better preserved. They occurred in concentrations with large amount of refitted pieces.
While the assemblage recovered in complex A and B suggests the existence of long-term multifunctional site or was formed during several independent settlement episodes (palimpsest), the collection of younger artefacts rather indicate short-term activity focused mainly on rejuvenation of tool kits.

Fauna derived characteristic for both settlement episodes (A+B and C) is typical for steppe-tundra environment. The complex A+B comprises abundant remains, including bones, antlers and teeth. Mammals are represented by bovids, horses, mammoths, rhinoceros herein woolly rhinoceros and a single tooth of Merck's rhinoceros (allochtonous), reindeer and probably other Cervidae as well as carnivores. The whole collection is prevailed by bovid bones and teeth with the predominance of the first group. There are also single fragments of skull bones, humerus fragments, foot bones and their fragments. The bone assemblage from complex C, dominated by bovids, contains also remains of horses and rhinoceros. Within it, bovids are represented by fossils of cranial skeleton while horse and wholly rhinoceros only by teeth. Considering the meaning of the fauna remains assemblage in the context of coexisting in this place artefacts two hypotheses can be proposed: 1. an effect of specific fossils deterioration resulted from the activity of natural processes such as weathering or fluvial transport; 2. a result of human selection during butchering i.e. carrying out chosen corpse elements from the killing site to the camp.

During the field work carried out in 2006 a dozen of samples for OSL dating from mineral sediments (complexes A-D) were collected. The estimated OSL ages of complexes with abundant artifacts vary from 51.9 ka to 80.4 ka (A+B) and from 53.8 ka to 57.5 ka (C). In contrast, the youngest complex D (deprived of artefacts) is dated from 53.9 ka to 31.0 ka. According to these data, the age of the older stage of settlement corresponding to complexes A+B can be linked with OIS 5(a-d) and the beginning of OIS3 with the probable exclusion of the OIS4 cold phases. In this connection the dating of the younger settlement (within complex C) episode allow us to synchronies this event with the beginning of subsequent warming during OIS3.

Beyond question is the fact, that the lowland part of the Odra drainage was an area of intensive activity of Neanderthal's hunters. Absolute dating of mineral sediments together with archaeological as well as pelaeozoological records allow us to claim, that the occupational episodes took place during warmer phases. The time span of occupation is still under discussion. It is certain that the geological position of the younger settlement is associated with the beginning of the interpleniglacial (OIS3). The older occupation can be dated to the early Weichselian (OIS5d-4). However, in the light of absolute dating of the geological context, the younger age cannot be excluded.

The structure of mammal species identified in the studied location as well as the stable oxygen isotope composition of bone phosphates suggests that the ecological conditions were similar during both settlement episodes. While steppe-tundra dominated the European Lowlands, the reconstructed temperature-related stable oxygen isotope composition of mean environmental water available for animals was close to these observed currently for Northern Scandinavia. Despite of similar environmental conditions, the archaeological records appear to represent different technocomplexes and diverse types of activity. The older one corresponds to the Mousterian technocomplex and multidirectional behaviour while the younger to Micoquian (?) technocomplex and narrow range of activity. In both assemblages prevailed formal tools and formal technologies perhaps resulted from intensive hunting.
It is worth to highlight that similar age has also been assessed for several other Middle Palaeolithic sites located within a 2.5 km radius from the site at Hallera Av. Moreover these spots probably belong to the same phase of occupation. In this connection several other locations, dated to the beginning of OIS 3, are known from uplands and mountain areas situated south or south-east to the Silesian Lowland. These data support the Neanderthals' mobility model, based on analysis of raw material circulation, according to which archaic human migrated from south to north and vice versa.

This research raises several crucial questions concerning the settlement dynamic. Do the findings represent the traces of a long term occupation or a short term seasonal stay? What was the motive behind the decision of lowland area exploitation? Wheatear the human mobility corresponded to seasonal megafauna movements or large-scale fauna migrations due to regional climate change? These issues will be the subject of further investigation.

GUIDE BOOK

with contributions of

Lenka Lisá, Petr Neruda, Zdenka Nerudová, Miriam Nývltová Fišáková, Ofer Bar-Yosef, Martin Oliva, Jiří Svoboda

and acknowledgement to Alex Pryor

Program of excursion:
8,00: departure from Brno (meeting point is in front of Janacek Theatre)
9,00 -12,00: **Dolní Věstonice, Pavlov, Milovice**
12,00 -13,00: return to Brno
13,00 -14,00: **Stránská skála, Líšeň**
14,00 departure to the Moravian Karst
14,30 - 15,30 **Kůlna Cave**
15,30 -16,00 **Balcarka Cave**
Approximately 17,00 arrival to Brno in front of Janacek Theatre.

THE DOLNÍ VĚSTONICE – PAVLOV SETTLEMENT COMPLEX

Lenka Lisá and Miriam Nývltová Fišáková

The loess deposits in Dolní Věstonice (South Moravia, Czech Republic) (Fig.1) were developed under conditions of a Panonian dry area (Kubiena, 1956) and display a huge number of warming, cooling or wetting trends (Klima et al., 1961, Demek and Kukla, 1969, Haesaerts and Mestdagh, 2000). Warmer and usually more humid periods are typifiedl by more or less developed paleosoils, cooler and arid periods by loessic sedimentation and humid periods by gley horizons. The provenance material of the Moravian loess was derived from frost shattered and weathered westerly-situated magmatic and metamorphic rocks (Lisa, 2003, 2006) and calcareous Miocene deposits (Adamova, Havlíček, 1996). The provenance is mostly unchanging and the grain differences depend mostly to the wind rapidity or postdepositional weathering.
Many studies of the paleosoils and climate have been conducted on the Last Glacial sequences at the Dolní Věstonice site (Demek and Kukla, 1969, Kukla and Koci, 1972, Frechen et al., 1999). The last interglacial and the early glacial are recorded by two pedocomplexes (PK3 and PK2) and by one interstadial paleosoil (PK1). The presence of very thin and poorly developed soil layers or gley horizons are mentioned, but climatic interpretations are focused mainly on the PK1-PK3 soil layers.

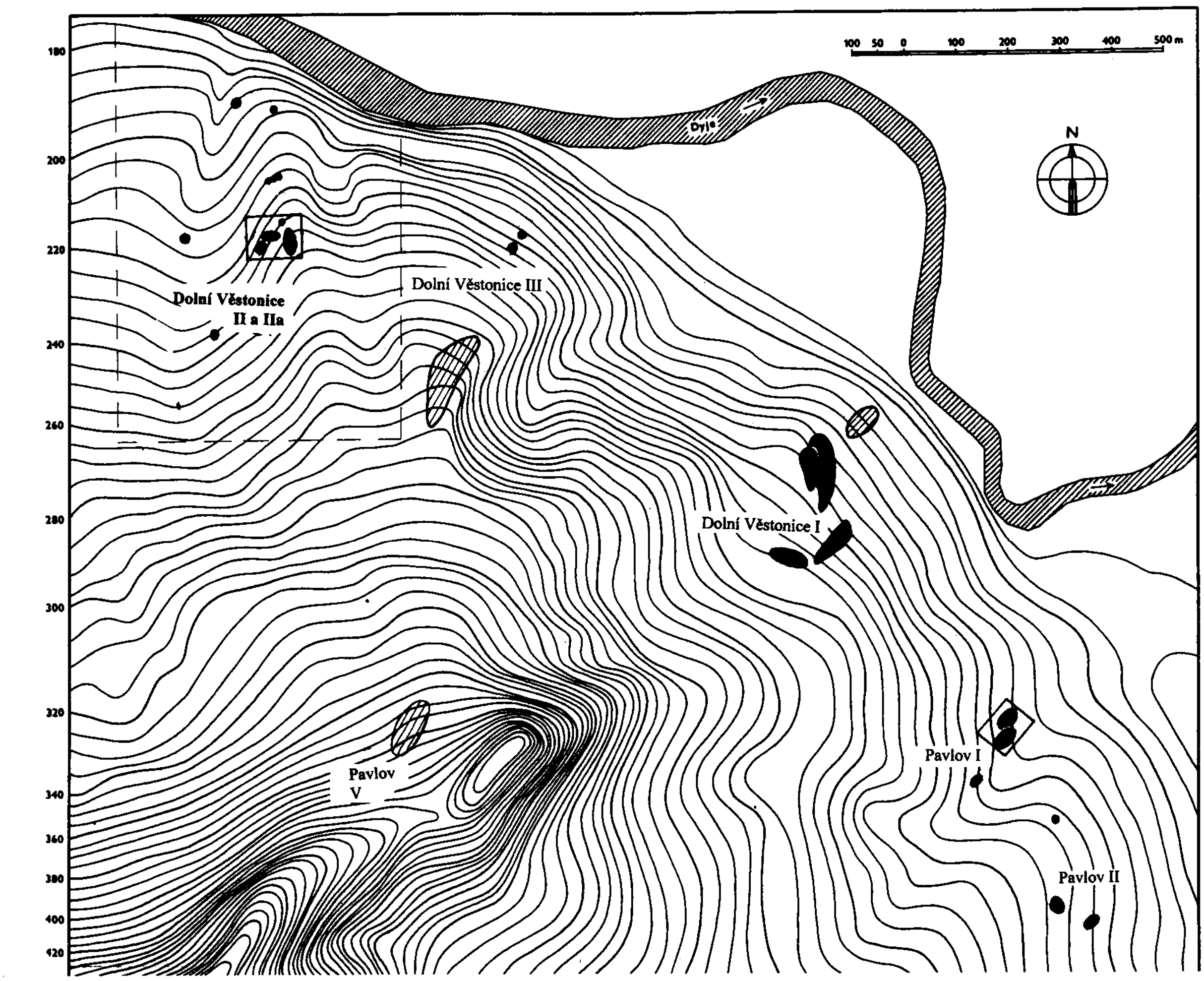
Fig 1. Palava Hills (drawing P. Neruda)

DOLNÍ VĚSTONICE I. LOCALITY
This locality, together with Pavlov I. is defined by its complexity. Evidence of Palaeolithic settlements and also of art and burials were found here (Svoboda, 1999). Over more than 70 years, this locality was excavated using a number of research techniques. The famous Czech archaeologist Karel Absolon worked here between 1924-1938 and during the Second Word war A. Bohmers worked in Dolní Věstonice. Other famous Czech archaeologists worked here after the Second Word War (Karel Žebera - 1945-1946, Bohuslav Klíma - 1947-1952, 1966, 1971-1977) and most recently Jiří Svoboda has worked here since 1990.
Rounded structures composed of stones and mammoth bones (interpreted like houses), stone and bone tools and artefacts, bones of different animals, and fragments of human bones together with evidence of the oldest ceramics and reflections of textiles were found here.

It is possible to divide the DVI locality into the lower, middle and upper parts. The lower part is dated to 31 000-27 000 BP, and the middle and upper parts are dated before 25 000 BP according to C14 from charcoal. Relicts of fireplaces with pitholes on the edge were found, animal bones and fired sculptures of animals and humans in the middle part of the DVI locality. Professor Absolon found the famous Věstonice Venice in 1925 in upper parts of this DVI station. A very noticeable object of rounded structure and constructed from mammoth bones with a fireplace in the central part was located in the western part of DVI locality. This object was interpreted as the first described dwelling made from mammoth bones in the area of Czech Republic (Svoboda, 1999). A human skeleton lying on its right side, excavated in a shallow depression on the edge of the first settlement cluster was interpreted as the burial of a shaman-woman. The skeleton was found in a crouched position and was interpreted as the secondary burial of a partly decomposed body. There were two mammoth scapulas and half of a mammoth pelvis protecting the burial. A series of parallel scratches were found on the lower side of the scapula protecting the skull. The bones were covered by a crust of red pigment, and in close proximity to the bones a few incisors of polar fox and some stone artefacts were found (Svoboda, 1999). The biggest mammoth bone depository was situated close to a watery depression, and was around 45 meters in length and 12 meters wide. Mammoth molars found in this depository indicate at least 85 individuals were present. Bones of horse, wolf, reindeer or hare were found just occasionally.

Fig 2. River Dyje Valley, the view from Palava Hills (drawing P. Neruda)

The second dwelling structure situated above this irrigated depression was excavated between 1951-1952. The object was sunk nearly 80 cm into the slope. The removed material was consolidated by stones and clay. This structure was composed of something like a wall surrounding a space of 6 meters diameter. Six big pitholes, previously strengthened by stones and three small holes in the centre of structure were preserved. A visible entrance part was preserved in the direction of the slope. The whole structure was covered by mammoth bones and stones, interpreted as the destruction phase of the house. The fauna from this locality was described by Musil (1958). It is comprised mainly of mammoth, but fox, hare, wolf, horse and reindeer were also documented. Mammoth bones prevail in the so called mammoth deposit, while small fur-bearing fauna dominate in the dwelling areas. A huge number of stone artefacts made of erratic siliciclastic rocks and radiolarites, and also bone artefacts were documented. Different tools made of mammoth bones and ivory were also found.



Spacial structure of the Upper Paleolithic settlement in Dolni Vestonice-Pavlov area (adapted from Svoboda, 2001)

Fig.3.

DOLNÍ VESTONICE II LOCALITY

The site of Dolní Věstonice II is stretched out on the western edge of a continuous range of Gravettian localities beneath the Pavlov Hills (Svoboda, 2001). Individual dwelling structures and concentrations are situated on the west slope of a hillock leaning into an elongated lateral ravine. This ravine in fact composes the western edge of a continuous loess cover and also Palaeolithic occupation. A deposit of mammoth bones was excavated in the remains of sandy deposits in the bottom of this ravine. A rich abundance of water mollusca typical for stagnant water was confirmed by Dr. Kovanda. The western part of this ravine is filled by younger deposits, terminated by Holocene deposits. The northern part of the DVII locality consists of the old brickyard, known as “Kalendář věků/Calendar of epochs” which is a natural monument under governmental protection. The localities named are situated above the old brickyard and were opened during rescue excavations during dam construction in 1985-1987 (Svoboda, 2001). The southern part of the DVII site lies closer to the slopes of the Pavlov Hills and is composed by two situations “Pod Lesem” and “U kapličky” (marked as DV-IIb) (Svoboda, 2001).

OLD BRICKIARD

As mentioned above the old brickyard is a natural monument under government protection, situated on the edge of the Dolní Věstonice village. This locality is stratigraphically very important, but not many archaeological findings were documented here during the excavations of Klíma in 1959-1960 (Klíma, 1962). The artefact collections found during excavations are poor and typologically indistinguishable, but because of the situation and availability of radiogenic datesare very important. The biggest collection (20 stone artefacts), dated to the Early Pavlovian (29 000±200 non-calibrated BP) was founded in the eastern wall. Fireplaces situated in the eastern wall have a different character (much younger in date - 25 740 ± 210 non-calibrated BP) and they are probably connected with the edge of a mammoth bone depot (Klíma et al., 1962; Svoboda, 2001).

CHRONOLOGY OF DOLNI VESTONICE II LOCALITY

The lower part of the Dolní Věstonice II site (eastern wall of old brickyard, lower northern slope) belongs to the Upper Pavlovian (30-27 000 BP). Dating is based on charcoal and just rarely connected with artefacts. Three dwelling sites marked as 1985 A-C were distinguished in the lower northern slope. A similar situation was described also at the DV I site (Svoboda, 2001).

More systematic settlement of the whole area of the DV II locality is dated to the terminal Pavlovian (27 – 25 000 BP). Two burial features (the triple burial, and the burial of an individual DV16) found in the DV II locality belong to this stratigraphical position. Intentional burial rites with analogues to modern Siberian nations were proved in the case of the burial of hunter DV16) (Nývltová Fišáková and Sázelová, 2008). The phraseology analyses, together with analyses of tooth cement microstructures and analyses of hunted fauna, confirmed that the settlement (Šajnerová, 2001, West, 2001, Nývltová Fišáková, 2001, 2007), together with the mammoth bone depot was active around the year at this stage (Svoboda, 2001).

Settlement of the DV II locality and also of the whole settlement complex of Dolní Věstonice - Pavlov faded away in the so called late Pavlovian, Willendorf-Kostěnkian phase (25-21 000 BP). A part of the western wall of the old brickyard and also the Dolní Věstonice III locality, cluster 1, belongs to this stage (Svoboda, 2001).

HUNTED ANIMALS OF DOLNÍ VĚSTONICE II LOCALITY

Fauna of Dolní Věstonie II locality was described by Nývltová Fišáková in 2001 and also by West in 2001. The bones of mammoth are prevailing in this locality, but also bones of other animals, like reindeer, horse, wolf, foxes and hare were founded here. Those animals were hunted all over the year according archaeological findings, frazeological analyse and according the analyse of toothe cement microstructures (Návltová Fišáková, 2007)

DOLNÍ VĚSTONICE II. NEW SECTION

A 4.2 m loess sedimentary sequence situated in the terraces above the old brickyard was excavated in 2005. This sequence contains the A and B horizon of the PK1 soil layer, a Gravettian cultural layer and several poorly developed soil horizons terminated by the Holocene soil layer. The entire profile was developed in loess sediments of an unchanging provenance.

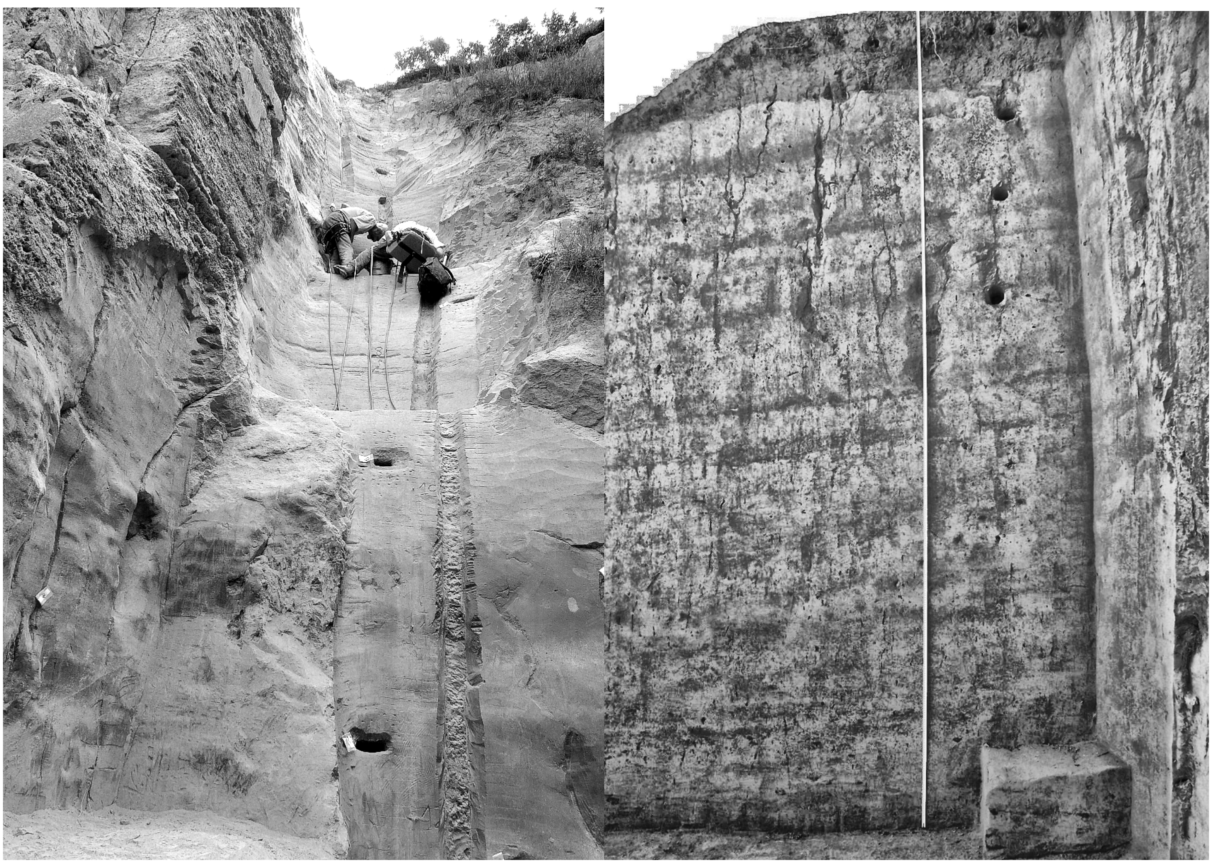


Fig 4. Old bryckiard section during D.D. Rosseau excavations in 2009 and New section from M.K.Jones and J.A.Svoboda excavations in 2005 (photo L. Lisa)

The geochemical and micromorphological methods together with magnetic properties were used for a profile description. Three different parts were divided there according to field and laboratory observations.

The lower part, marked as DV x1 is 1.6 m thick and contains the A and B horizons of PK1, laminated loess sediments with freeze-thaw structures, the Gravettian occupational layer and some gley-like horizons. The ratio of Ca/Mg together with the amount of Na in expandable clay minerals and magnetic susceptibility of sub-micrometer ferrimagnetic particles increases in the B horizon of the PK1 soil layer and correspond to a bit more intensive weathering but still under arid conditions (Brady, 1990) and natural soil development (Shaw et al., 2001, Maher and Thompson, 1999). The A horizon and loess above those sediments together with the occupational layer are interrupted by thin clayey and fine grain quartz layers. These layers respond to seasonal washout movements. Thawing and freezing structures are also present there. The gley-like layers above are typified by an increase in CaCO3 at the base, but minimal changes are recorded in the Ca/Mg ratio of expandable clay minerals. There are a lot of free voids due to the in-situ oxidation. Such conditions could occur in water-saturated soil covered by vegetation. Some leaching structures are also present but are not very intensive and, except the Ca movement, there is no proof of downward movements in the profile. The presence of permafrost possibly provided a leakproof layer, and locked the underlying soil sediments. The presence of permafrost is documented by freezing and thawing structures and textures. The PK1 soil marks the end of the last interstadial of MIS3, and the soil layers above represent cold and wet conditions during the LGM. These conditions were evidently very important for the Gravettian culture.

The second distinguished horizon, marked as DV x2, presents a rapid change in precipitation. More than 1.5 m of dusty loess deposition is interrupted by series poorly developed soils. There are minimal geochemical changes in this part, although the Ca/Mg ratio in expandable clay minerals has an increasing trend, and soil carbonates are abundant due to weak leaching. These variations were responding mostly to temperature changes. The climate generally became more arid and cold.

The upper part of the profile DV x3 [1.1 m] is terminated by Holocene pedogenesis. This part of the profile is typical loess sediment with extremely poorly developed soil horizons. Only in the topmost part are there geochemical and magnetic variations, which respond to more intensive climatic changes at the very end of the Last Glacial Period (Maher and Thompson, 1999, Anderson et al., 2007), when the climate became more humid and warmer.

PAVLOV I. LOCALITY

The Pavlov I locality was systematically excavated by Klíma (Klíma 1954, 1955b, 1957c, 1959a, 1972c, 1973b) and final interpretations are still being made (Svoboda, 1994, 1997, 2005). The excavated space was divided by Klíma (1963e) into NW and SE concentrations. The central fireplace and mammoth bone depots so typical for Dolní Věstonice I are missing at the Pavlov locality (Svoboda et al., 2002). The cultural layer was composed of brown-grey to black ashy material with bones, charcoal, artefacts and pigments, and was already partly ploughed and partly hidden under the loess cover of Palava Hills slopes. This locality is dated to the terminal Pavlovian (27-25 000 non-calibrated BP).
A male grave partly destroyed by solifluction was found by Klima in 1957 (1959b) in the NW part of locality, which is located on the edge of an erosion gully. The body of the man was oriented on the right side and was covered by a mammoth scapula. Scratching is visible on the lower part of this scapula, which played a protective role, and the body stayed preserved. The skull which was not protected was redeposited down the slope. Anthropogenic research was made by E. Vlček (1997).

Osteological research on the material from excavations in 1952 and 1953 was performed by Musil (1955b, 1959b). The predominance of fox and polar fox, hare and reindeer are very common. Less common are the remains of wolf and birds. Bones of mammoths, wolverine horse, cave bear and brown bear, lynx, lion, bull and deer are presented but very rare (Musil, 1994, 1997). Younger individuals are prevailing.

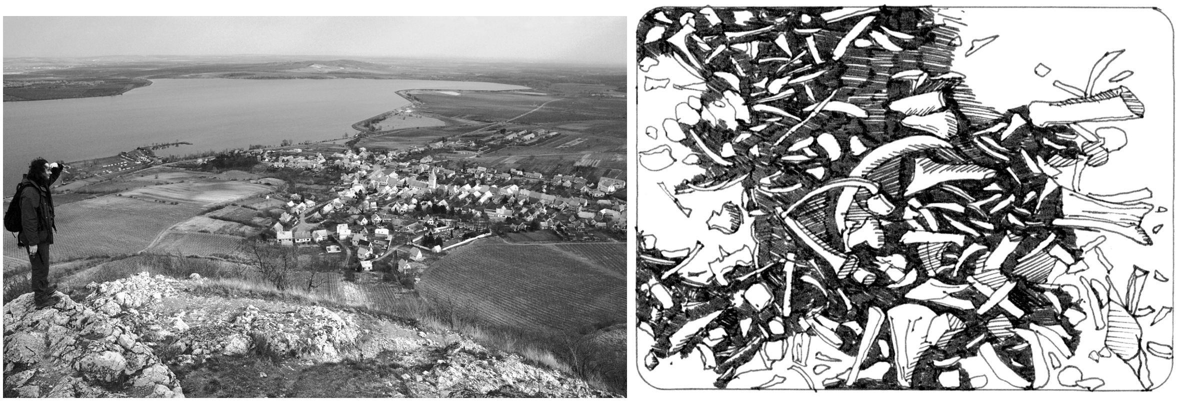


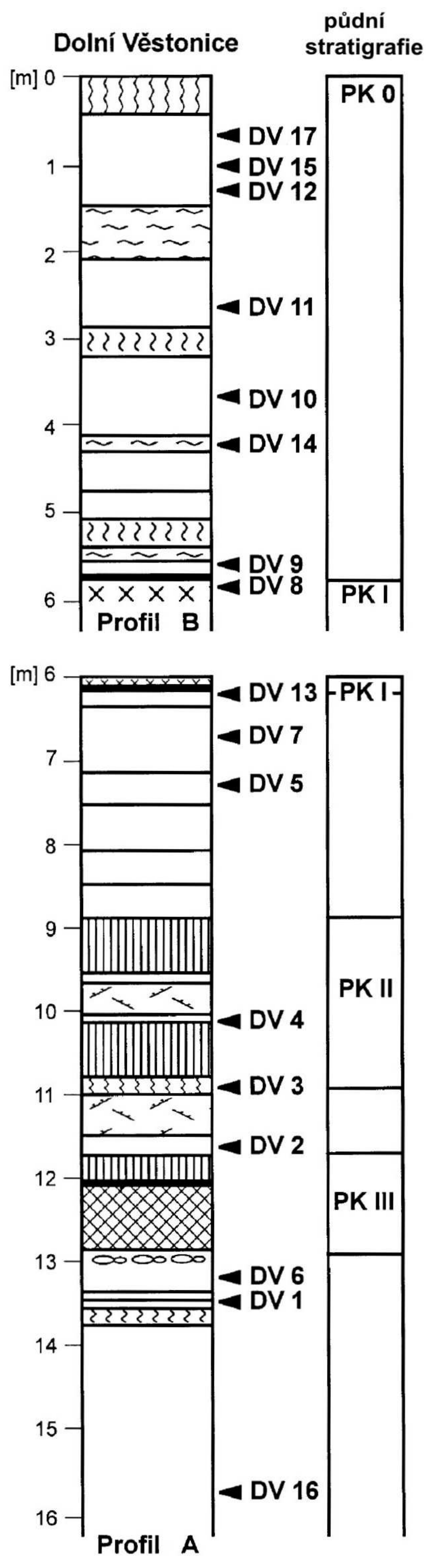
Fig 5. Like Palaeolithic hunter observing the landscape around Pavlov and mammoth bone depot (photo L. Lisa, drawing P. Neruda)

PAVLOV II LOCALITY

Another station is located approximately 300 m to the SE (Klíma 1961b, 1976). The cultural layer was deposited in colluvium, sometimes covered by Wűrmian loess, sometimes exposed on the surface. Artefacts and bones were concentrated according to a line composed by five fireplaces. Two of those fireplaces were surrounded by bigger stones and bones (Svoboda a kol., 2002). Fauna was characterised by mammoth and horse, less so by bones of wolf, reindeer and just rarely hare, lion, wolverine and fox (Klíma 1961b, 1976).

PAVLOV IV LOCALITY

A lens of humic deposits was found in 2007 during construction works in the area between Pavlov and Milovice. This locality was marked as Pavlov IV (Svoboda et al., 2008, 2009) and was dated by C14 to 28-29 000 BC (cal.). A big fireplace surrounded by small holes was found approximately at the centre of the excavated area. Nevertheless the excavated area was quite small; a huge number of artefacts, art, bone tools and faunal remains were found. The following woody species were described (Svoboda et al., 2008): Picea abies, Larix decidua, 3 fragments of Pinus silvestris and one piece of Quercus sp.. Faunal remains were described by M. Nývltová Fišáková (Svoboda et al., 2008, 2009). Most of the bones belongs to mammoth and are followed in abundance by wolf, with less horse and reindeer. Rarely represented are bones of fox, wolverine, bear and hare. A unique impression of reindeer hairs was found in a fired piece of loess (Králík et al., 2008; Svoboda et al. 2009).



Interpretace	TL ages [ka]		IRSL ages [ka]	
	REGEN	ADD	REGEN	ADD
holocenní půdy	23.7 ± 2.4	26.0 ± 2.6	17.5 ± 1.7	22.1 ± 8.1
slabě vyv. mrazový glej	23.2 ± 3.0	23.5 ± 4.1	14.8 ± 1.8	
spraš	20.3 ± 2.0	24.9 ± 4.8	15.2 ± 1.5	19.0 ± 7.7
mrazový glej	20.0 ± 2.3	24.4 ± 4.5	14.8 ± 1.5	15.6 ± 3.2
spraš	24.6 ± 2.2	25.6 ± 2.7	15.8 ± 1.5	16.4 ± 8.5
slabě vyv. mrazový glej	30.1 ± 4.7	27.4 ± 4.0	19.6 ± 2.3	20.4 ± 4.2
mrazový glej	27.0 ± 4.4	28.2 ± 2.8	22.6 ± 2.4	21.4 ± 2.8
přemístěná spraš	27.8 ± 3.0	29.6 ± 2.6	23.1 ± 2.3	25.8 ± 2.8

slabě vyvinutá hnědozem	50.8 ± 6.9	55.5 ± 4.9	44.0 ± 3.9	47.1± 9.9
písčitá spraš	48.5 ± 6.2	49.0 ± 4.3	45.5 ± 4.3	40.6 ± 4.7
	56.5 ± 7.4	60.2 ± 5.3	43.1 ± 3.9	43.5 ± 11.7
přemístěná spraš				
svrchní černozem				
peletové písky				
sprašový marker PK II	60.8 ± 5.7	81.3 ± 7.1	54.3 ± 5.1	57.5±26.6
spodní černozem				
B horizont	81.8 ± 7.7	105.5 ± 9.1	70.9 ± 6.9	84.2±10.7
peletové písky				
sprašový matrix	75.3 ± 11.6	61.9 ± 5.4	66.6 ± 6.5	59.0 ± 8.0
černozem				
Dt horizont PK III				
spraš	116.6±11.3	132.9±11.5	85.5 ± 10.4	87.5±18.4
mrazový glej	112.0±14.3	127.7±11.2	96.2 ± 10.4	102.3±14.5
písčitá spraš				
	390.6±55.4	348.5±33.6	128.0±11.0	138.2±24.4

Fig 6. Loess stratigraphy in Dolni Vestonice Area (adopted from Frechen et al., 1999)

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THE MAMMOTH HUNTERS OF MILOVICE

Martin Oliva

The Milovice I station – “Mikulovsko” lies between 225 and 240 m above sea level on a short and broad ridge about one kilometre SSW of the village of Milovice (District of Břeclav). The ridge points out towards the NE from a flat projection attaining 327 m a.s.l., belonging to the eastern part of the wooded Mikulov Hills. In the NE to SE direction, the hill descends to a valley the bottom of which lies at 200 m a.s.l. immediately below the station. About 600 m towards the north, this wide and dry valley becomes narrower, pointing towards the floodplain of the river Dyje in the NEE direction. The present position of this river is about 3 km distant from the station. A direct view of the floodplain is obstructed by two distinct hills: Strážný (Brněnský) Hill (266.6 m) in the north, and Špičák Hill (293.3 m) in the east. It is evident from the geography that below the archaeological locality, the blind valley was never a typical passage for herds of animals, nor was it a natural trap as here were no insurmountable barriers to obstruct their movement. It is most probable, however, that to mammoth herds it offered rich pasture as well as peaceful nook, yet only in the absence of man. During the spring thaw, there was a creek in the valley, which was probably several metres deeper in the past (as estimated by T. Czudek), and the swampy areas along the creek offered suitable conditions for mammoth hunting. It was reported that in several places in the Milovice valley G. Lintner, a well-digger, struck in 19. century a layer up to one metre deep that contained numerous bones of “ante-diluvium” animals. Amongst others, he records locations at a depth of 11-12 m deep near the church, 9 m deep at house No. 39 and 4-5 m deep in the cellar of No. 37

A rich mammoth bone layer was discovered there in 1986 when obtaining earth for the construction of the dam for the Nové Mlýny Reservoir. The underlayer of the locality is formed by grey calcareous sandstone of the Ždánice-Hustopeče group of beds of the flysh Ždánice unit. The oldest Quaternary sediment is represented by a braunlehm layer, up to I m deep, of at least Middle Pleistocene age, found in the underlying bed of sector N. The earliest evidence for the presence of man (Aurignacian) come from soil sediments that occurred beneath the Gravettian layers. In sector L, red burnt layers occurred in places, surprisingly enough invariably in direct superposition. Likewise, concentrations of Aurignacian artefacts, both near fireplaces and elsewhere, penetrated all ash layers and formed a kind of three-dimensional clusters (sectors L, R, and M). In sector L, the bottom limit of these layers was dated at 32 thousand years; their upper limit in sectors D and L, around 29 thousand years. It is difficult to explain how the fireplaces and zones containing tools could stay in identical places for such long periods. Major vertical movements of artefacts can hardly be expected in fine sediments and this would not at all explain the superposition of the burnt levels. In the given conditions, the most acceptable explanation appears to be in a somewhat fantastic idea that the fireplaces and work zones were maintained in identical places throughout the period of deposition and under continuous flow of sediments from the upper parts of the slope.

The series of layers mentioned above is superimposed by pseudo-gleys in their initial development, corresponding with raw soils of fully glacial sections of the Arctic paleo-pedological province. They were covered by a complex of washed loess, considerably altered by human activity in places. It is most intact in sector G where only a slight alteration of its surface is observed, meaning that the finds in the Gravettian layer occur in disconnected ash lenses up to 5 cm deep and at most 15 cm distant from each other in a vertical sense. Considerable mixing of the cultural layers took place in the northern part of the locality where, in the uppermost parts of sector R, the finds were scattered in declined straight-stripped layers up to 60 cm in total depth.

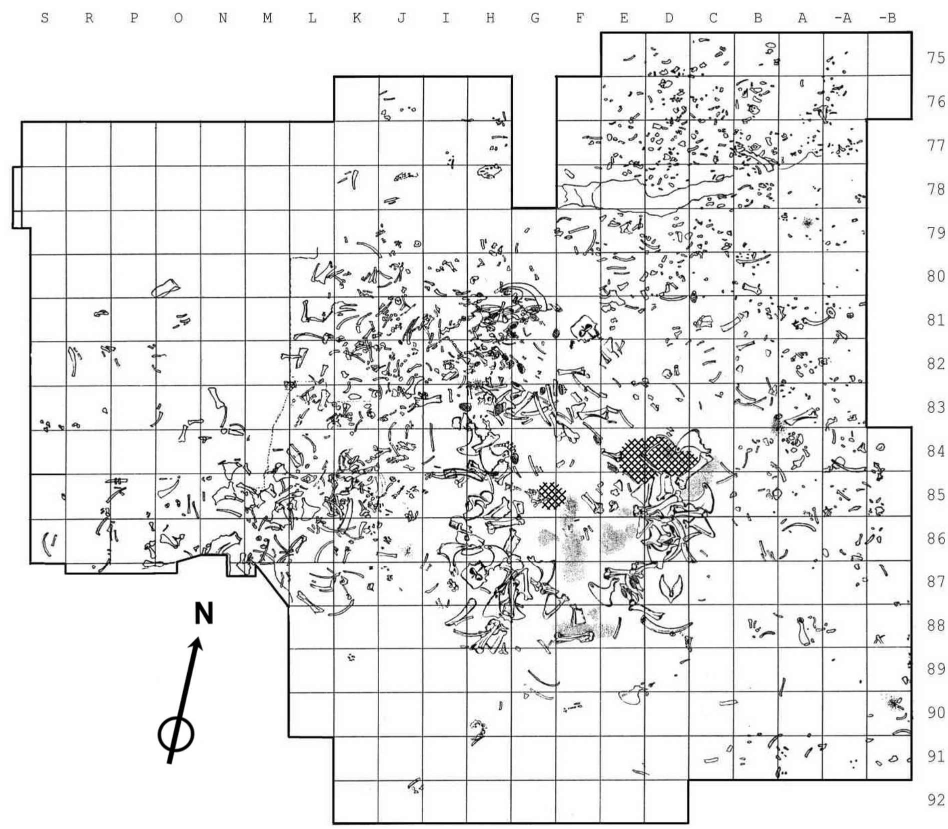

Fig 1. The spatial distribution of bones and artefacts at Milovice sector G

<u>Radiocarbon dating:</u>

Settlement in sector G
GrN-14824 25,220 ± 280 BP, charcoal, ashy zone N of the hut
GrN-22105 25,570 ± 170 BP, charcoal from fireplace, near entrance to the hut
ISGS-1903 24,130 ± 460 BP, bone from environs of the hut, 1988
ISGS-1690 22,900 ± 490 BP, charcoal from environs of the hut, 1987
ISGS-1691 21,200 ± 1100 BP, charcoals from metres 77-78/A-B, 1987
Accumulation of mammoth bones in sector B
GrN-22104 24,530 ± 300 BP, charcoals from fireplace S of mammoth-bone bed
ISGS-1902 17,500 ± 1100 BP, bone, excavation in 1988
Mammoth-bone bed in sector K
GrN-29163 25,900-480+510 BP, mammoth bone

ISGS-1901 22,080 ± 530 BP, bone, excavation in 1988

Sector L

GrN-22106 24,710 ± 300 BP, charcoals from hearth with leaf-point on base of stripped layering with Gravettian finds

GrN-22107 28,780 ± 230 BP, charcoals from upper horizon of Aurignacian layers in superposition of several fireplaces

GrN-22108 32,030 ± 370 BP, lower horizon of Aurignacian, same superposition of fireplaces

Sector D

GrN-14825 22,100 ± 1100 BP, charcoals from fireplace of upper part of redeposited Gravettian layers

GrN-14826 29,200 ± 950 BP, upper level of charcoals in soil sediment with occasional Aurignacian finds

Above road SW of sector A

GrN-14827 29,400 ± 500 BP, brown soil sediment with spruce charcoals.

The predominance of fir (anthracological analysis by E. Opravil), a tree species comparatively particular as regards climate, even in samples from indubitable Gravettian and Upper Gravettian layers seems to be at variance with the cold climate indicated by the presence of the columella fauna (analysed by J. Kovanda).

The macrofauna from sector G is being treated by S. Péan, of the IPH in Paris, and from the remaining sectors by A. Brugère and L. Halámková (mammoth bones). Among the 40 animal individuals represented in the area G (approximate MNI) 21 of these are mammoth (566 bones), i.e. about a half the number. As to the remaining animals, reindeer (8) and carnivores (7) are most frequently represented; there are three horses and just one hare. Of mammoth bones in general, the most numerous ones include molars, shoulder blades, mandibles, and pelvic bones. Skull parts are more frequently represented than those of autopodia, and consequently also the first vertebrae, i.e. atlases. In contrast to 11 young mammoth there occurred only 6 juveniles and 4 young adults. The share of mammoth bones in other sectors is yet much higher, varying between 86 and 100 %. In both the richest sectors, pelvic bones (A + B) and femora (K) are most frequent among the mammoth bones, followed by the other long bones and pelvic bones. Compared to sector G, there are fewer skull parts and more autopodia, parts of vertebral columns (in A + B even in anatomical connection), vertebrae and ribs, but all sectors mentioned here have been interpreted by archaeozoologists as places in which the mammoth perished or were killed. The accumulations of mammoth bones in the settlements or close in the vicinity of settlements, or immediately over the remains of the settlement structures with numerous artefacts (DV I, Cracow-Spadzista) presume a considerable human input, and thus they should be examined from the standpoints of all conceivable aspects of human behaviour.

In the uppermost sector G, the area rich in finds ended in a circular structure built of mammoth bones (fig. 5-6). The bones used in it were selected by size, such as scapulae (15) or pelvic bones (13). They were placed in horizontal or just slightly declined positions all around the circumference, in most cases beneath other smaller bones. Most of the long bones were also posited radially all around the circumference, pointing toward the inside of the structure. The same holds for mammoth tusks, however preserved as fragments only. The western side of the structure consisted mainly of several mammoth skulls, such a case occurring nowhere else.. The entrance to it pointed towards the north, opening a view of the mouth of this valley into the floodplain of the Dyje River. A break in its southern side probably indicated a rear entrance. In the western part of the interior, there was a rather small hearth with baked earth and, on a slightly higher level, several ash-coloured blotches. Mainly bones were burnt in the major hearth lying outside the northern entrance. North of the shelter spread the proper settlement area, covered with ashes from a large fireplace mentioned above. Abundant chipped industry was found among thinly scattered bones. Here the Carpathian radiolarite was the predominant material, this being the only Moravian locality in this respect. The absence of non-reduced cores and larger blanks suggests that this material was utilised quite economically. It is important to note the occurrence of several artefacts made of central Slovakian or Hungarian limnosilicite, as well as a flake of obsidian. Larger tools were made of erratic flint. The latter were probably obtained from the neighbouring stations at Dolní Věstonice and Pavlov whereas the radiolarite may have been traditional raw material of the group's own. Even the small dimensions of the tools are uncommon. The predominant miniature backed points with supplementary ventral retouch at their ends, as well as the minute shouldered points resemble the Mediterranean Gravettian assemblages. Even though this inventory probably cannot be associated with the Pavlovian s. stricto, the absolute dating between 26 and 25 thousand years ago does not differ from the classical localities at Dolní Věstonice and Pavlov.

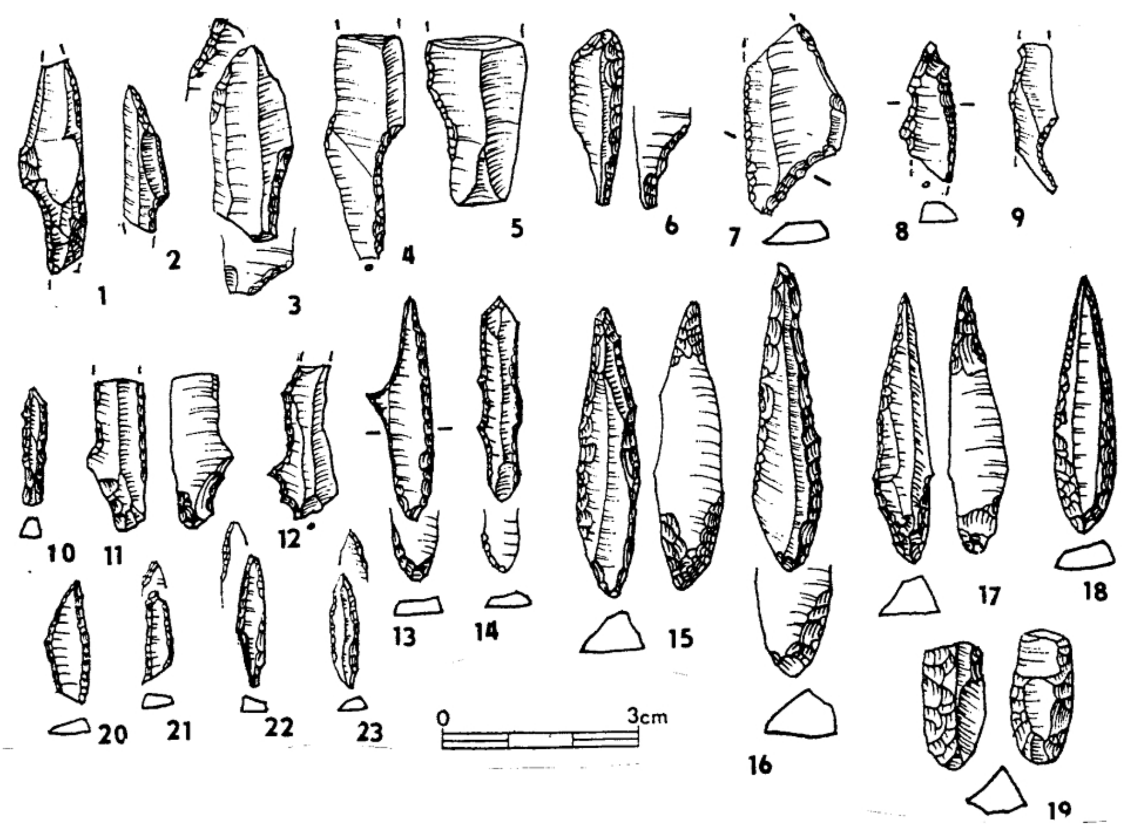

Fig 2. Microartefacts from Milovice sector

In contrast to the classical Pavlovian, the local industry contains no items made of bones and mammoth ivory, only some haftings of deer antlers. Objects of art are missing but decorative objects made of Tertiary shells are common. West of the shelter, there was an accumulation of mammoth bones, overlapping near it a mammoth skull, an extracted tusk, and a large adze made of reindeer antler. A lion paw skeleton was lying between the skull and the tusk.

A new site (Milovice IV) located near the church, at the entrance to the valley was discovered this year. The site has features typical for Milovice I (like small lithic implements, many backed points made of radiolarite) as well as for pavlovian sites above the Dyje River (DV and Pavlov – preponderance of non-mammoth fauna, erratic flints, ivory points, baked clay). This site seems to be a meeting point of the specialized mammoth-hunters of the Milovice I site and semi-permanent dwellers of huge pavlovian settlements. There was founded also mammoth ivory depot which was not documented before at Milovice I. site.

The large accumulations of mammoth bones (sectors A-B, K) and the displaced remains of the settlement over them (C-F) belong to younger phases of the occupation. Radiometric dating indicates that this was a settlement from 24-22 thousand years ago, that is, from the Upper Gravettian. This time, erratic flint is the standard predominant raw material; bifacially retouched leaf point occurred as a manuport from an earlier cultural milieu. The point was made of chert of the Krumlov forest type and shows distinct traces of surface alteration. The Kostenki points, typical of the Upper Gravettian, do not occur in this assemblage.
Large heaps of mammoth bones were found also in the Dolní Věstonice (I and II) and Předmostí sites. Whatever was the reason for their accumulation, these deposits are evidence of the hunting efficiency of the group. By no means were they mere kitchen offal or stored raw materials. There are too many big and heavy bones (mandibles, skulls, pelvic and scapular bones) of no evident use and, together with them, numerous isolated molars, and sometimes tusks. Certainly, there were diverse reasons for accumulating the bones, both practical and symbolic. We cannot dismiss the idea that the purpose of heaps of large bones may also have been that of territorial markers. In the same time, these enigmatic deposits tend to resemble collections of bones of prestigious kinds of game for representation and symbolic reasons. Etnological sources tell us that hunters would burn the bones or hang them on trees, heap them, place them in swamps etc. to appease a protective ghost called the "lord of game". To the Palaeolithic hunter, game was a partner rather than a mere prey. In the highly competitive mammoth hunter society, everyday life was interspersed with celebrations and rituals, and depositing the widest array of bones of prey animals could have been their significant component.

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Stránská skála

adapted from Jiří A Svoboda and Ofer Bar-Yosef eds.

Stránská Skála
origin of the Upper Palaeolitic in the Brno Basin, Moravia, Czech Republic

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THE MULTIDISCIPLINARY CHARACTER OF THE INVESTIGATION at Stránská skála allowed us to explore the site and its geology, biostratigraphy, and archaeology from several angles.

The results of the geophysical survey on the upper plateau (app. A) demonstrated that the depth of the Pleistocene deposits (loess and paleosols) and Tertiary sediments in W–E, SW–NE, and N–S directions reached a maximum of 8–8.5 meters (m). The overall depression of the limestone bedrock is interrupted by two linear morphological depressions, presumably with a tectonic predisposition, in both NE–SW and NNW–SSE directions, with a maximum width of approximately 35–40 m. The average thickness of the loess and detrital clays with occasional Paleolithic artifacts is approximately 1.0–2.2 m. A greater thickness of this complex (2.8–3.0 m), which looked promising for archaeological excavation, is expected only in the depression zone in the northeast section of the targeted area.

Geological research of the Pleistocene deposits (app. B) ascertained the presence of two basic paleosols of the Interpleniglacial below the last loess cover of the Upper Pleniglacial. The subsoil is irregular and is formed alternatively by areas with thick limestone debris accumulations (Ss-IIa and Ss-IIIb-east), and elsewhere by earlier soil sediments that were redeposited by gelifluction (Ss-IIIa, Ss-IIIb-west, and Ss-IIIc), or by basal loess (Ss-III and Ss-IIId). In several trenches (Ss-IIa, Ss-IIIa, Ss-IIIb, and Ss-IIIc), the two paleosols lay one on top of the other, whereas in the eastern part of the site (Ss-III and Ss-IIId), where the overall thickness of the Pleistocene deposits is largest, they are separated by a thick loess interlayer. Both paleosols included Upper Paleolithic artifacts and may thus be considered important stratigraphic and chronological markers of the Upper Paleolithic occupation sequence.

Based on observations of the soil micromorphology (app. C), the lower soil is a pararendzina (a weakly developed paleosol; see app. C), the stratigraphic and cultural meaning of which is still not well known from other Moravian sites. It is para-autochthonous (partially removed), with an admixture of small-sized gravels, and it may also contain pellet sands. Culturally, it contains Lower Bohunician artifacts and deformed charcoal lenses in redeposited positions. The upper soil, a weakly developed chernozem, has already been described in a number of other sites in south Moravia (Valoch 1996a). In certain sections it is separated into two or three subhorizons, with the Upper Bohunician artifacts at the base and the Aurignacian at the top. The effect of postdepositional disturbances is much less pronounced in this soil, so the artifact distribution and archaeological features such as hearths are almost undisturbed. Both soils may be placed at the beginning of a developmental catene (sequence of paleosols) starting with pararendzina and ending with initial chernozems, which corresponds to the stratigraphic position within the Weichselian Interpleniglacial (OIS 3). However, we expect that both soils cover, in fact, several climatic oscillations of a lower order that remain stratigraphically invisible.

Three earlier conventional ^{14}C dates for the Bohunician from Stránská skála, and three from Bohunice, placed this industry between 43 and 38 ka B.P. (Please note that this date is uncalibrated as are all other dates in this chapter; Svoboda, Ložek, and Vlček 1996; Valoch 1996b). The new series of ^{14}C measurements prolong the Bohunician occupation at Stránská skála until 34.5 ka B.P. Dates from the lower paleosol are between 41–37 ka B.P., and dates from the upper paleosol are between 38.5–34.5 ka B.P. From the upper horizon of the same soil, we see several ^{14}C dates related to the Aurignacian or undeterminable Upper Paleolithic occupation (33–29 ka B.P.), and two Epigravettian dates from the last loess cover (18 ka B.P.; table 2.1).

The paleosols and their paleobotanical and paleontological content document the more temperate periods at Stránská skála. Pollen and charcoal studies (app. E) suggest widespread grasslands with isolated patches of conifers and gallery forests along the rivers (Svobodová and Svoboda 1988). The paleobotanical reconstruction of these open landscapes basically agrees with the faunal evidence, as described in appendix F, with a predominance of horse, the presence of bovids, and the exceptional appearance of mammoth. These periods are correlated with the Bohunician and Aurignacian occupations.

Research on frost features (app. D) has provided new data on the effects of periglacial slope processes, gelifluction, and cryoturbation in these sediments (Czudek, Smolíková, and Svoboda 1991). This effect is mainly visible in the lower paleosol and in the underlying deposits, but also in the pre-Quaternary sediments at the base (Badenian, Jurassic). It appears that in certain periods, the periglacial climate at Stránská skála and its surroundings was extremely severe and dry. On the basis of laminar gelifluction observed in the soil sediments at the base of the Pleistocene deposits (Ss-IIIa and Ss-IIIc), and on frost wedges in various sediments in the surrounding area, temperatures (mean annual temperatures) during shorter episodes reached about -8° C. No traces of human occupation were recorded, and vegetation cover was probably sparse or absent. During the subsequent periods of this cold climate, based on the appearance of amorphous gelifluction, temperatures reached around -5° C. The earliest Bohunician layers were discovered in these horizontally redeposited layers. Although the upper Bohunician and Aurignacian layers were not displaced, at certain spots they were vertically affected by cryoturbation from below.

In conclusion, Stránská skála was uninhabited during the harshest periods of the Pleniglacial. The Upper Paleolithic occupations occurred during episodes of unstable climatic amelioration, with two visible pedogenesis events that were followed by periods of gelifluction, cryoturbation, and loess deposition. The Bohunician in Moravia occurs in weakly developed soil sediments, the formation of which immediately followed the harsh climatic conditions of the Lower Pleniglacial. Its further development took place under the changing conditions of the Interpleniglacial, which were responsible for the subsequent gelifluction of the soil sediments, limited loess deposition, and further pedogenesis of this loess. The new research demonstrates that in the upper paleosol, the Bohunician persisted longer than was previously recorded, and that it was immediately replaced by the Aurignacian in the upper horizon of the same paleosol. The whole sequence was finally disturbed by cryoturbation and then sealed by the last loess cover of the Upper Pleniglacial. Isolated human occupations, one of which is dated to 18 ka B.P., are also evident in this last loess cover (Ss-IIa and Ss-IV).

Archaeologically, the Bohunician industries of Stránská skála and their relationships to the other entities of this period, the Aurignacian and the Szeletian, represent a focal point of interest. Generally, the Bohunician tool types are Upper Paleolithic in character, with a predominance of endscrapers, some sidescrapers, and burins; at the site of Bohunice about five percent of the content was bifacial leaf points and a number of Levallois points. The core reduction sequences of the Bohunician (Svoboda and Škrdla 1995; Škrdla 1996) show that the process began with Upper Paleolithic crested cores and ended with flat cores reminiscent of the Levallois cores. In contrast to the traditional Levallois technology, the cores are oblong in shape with greater volume, and are reduced in a bipolar manner. Comparative studies suggest that this technology (Tostevin 2000) was practiced in the Near East (Ksar 'Akil, Boker Tachtit; Marks 1983). The Emiran is dated in the Levant to 47/46 ka, whereas the earliest Bohunician assemblages are slightly later (43/38 ka). The proposed date for a similar assemblage from the lower layer of Kulychivka (Ukraine), of 31 ka, is unfortunately not from a secure context.

Bohunician sites in Moravia have a particular geographic distribution. The site distribution starts in the Mohelno region in the southwest and ends in the Prostějov region in the northeast (Mohelno, Ořechov, the Brno Basin, including Bohunice, Stránská skála, and Ondratice). In south-central Moravia the sites are in proximity to the exploited raw material outcrops: the Stránská skála cherts and the Ondratice quartzites. Isolated open-air Bohunician sites are possibly Dzierzyslaw 1 and 8 in Silesia, and Hradsko in north-central Bohemia (Bluszcz, Kozlowski, and Foltyn 1994; Vencl 1977). At Dzierzyslaw 1, the Bohunician is stratified in the lower Interpleniglacial hydromorphic soil, with a horizon of Szeletian artifacts below it. The site of Hradsko may offer a parallel to Stránská skála in terms of its occupation sequence. It lies on a sandstone plateau and the artifacts were excavated from pure, fine-grained sands, originating from weathered subsoil rocks and filling various erosional depressions. They were found in a secondary position with some conifer charcoal and pieces of ochre. Typologically, these assemblages contain endscrapers, some of them carinated; a few archaic sidescrapers; and atypical burins. Among the flakes and blades, there is a large number of faceted platforms, and some could be classified as Levallois flakes and points. Vencl (1977) originally labeled the assemblage as Aurignacian with a strong Levallois component, and compared it to the surface collections in the area of Stránská skála (Podstránská). Following the excavations at Stránská skála, it now appears that the Bohunician and Aurignacian assemblages are incorporated within two sequential paleosols, hence corresponding to a rapid sequence of climatic oscillations. The lower Bohunician layer is strongly affected by gelifluction. The subsequent loess sedimentation and pedogenesis allowed the separation of the two soil horizons to be recognized. We therefore believe that at Hradsko, in a similar (but sedimentologically less recognizable) situation of redeposited weathered sandy sediments, it is possible that the artifacts from two succeeding occupations were mixed. If this is the case, the site would indicate a unique Bohunician occupation, located farther to the northwest than was previously known (fig. 12.1).

Other isolated sites with industries of comparable character may include the open-air site of Kulychivka in Volhynia (west Ukraine); the cave of Temnata, layer VI, in Bulgaria; and possibly Üćagizli in the Levant (Demidenko and Usik 1993a, 1993b; Ginter et al. 1996; Kuhn, Stiner, and Güleć 1999). Currently, the most fruitful comparison with the Bohunician can be made with the assemblages from Boker Tachtit in Israel, where similar core reduction sequence was also demonstrated by refittings (Marks 1983, chaps. 8 and 9, this volume). Somewhat similar Upper Paleolithic blade techniques, which preserve certain stylistic elements of the Levallois technique, have been documented in various sites in Central Asia, Mongolia, and China (Shui-dong-gou, for example), and in particular at Kara Bom (Derevyanko et al. 1998), but the nature of their relationship to the west Eurasian region is unclear.

There are several explanations for the strong technological similarities in lithic assemblages distributed so widely over the Old World. Two leading hypotheses are that there was concurrent in situ lithic development in several places and that there was radiation of technology from a single point of origin. Several authors argue for a local origin for the particular core reduction strategy from unidirectional Levallois industries, primarily in the Near East. Others suggest the same for Central Asia, west Ukraine, or the Balkans (Demidenko and Usik 1993a, 1993b; Ginter et al. 1996; Derevyanko et al. 1998; Kozlowski 2000). Whatever the place of origin may be, Levallois industries are almost absent in the Middle Paleolithic of the Middle Danube region. Therefore, at least for this region, we postulate that the lithic technology is intrusive from elsewhere. Given the chronological cline, the Near East is a likely candidate. Unfortunately, none of the Emiro-Bohunician sites of Eurasia provided human fossils.

Early Aurignacian dates from Central Europe are rare and appear at sites at considerable distances from each other. At Willendorf II, layer 3, the oldest Aurignacian dates are 37.9 ka and 38.8 ka, at Geißenklösterle (south Germany) the lower Aurignacian (layer III) dates are around 38.4 ka, and at Temnata cave (Bulgaria) the Aurignacian in layer 4, horizon C–A (overlying the so-called "transitional" layer VI), has an average date of around 38/39 ka (Haesaerts et al. 1996; Richter et al. 2000; Ginter et al. 1996). The majority of the dates from other Moravian, Lower Austrian, and Slovakian open-air sites are between 34 and 29 ka (Neugebauer-Maresch 1999; Svoboda, Ložek, and Vlček 1996). The use of blade technology and the presence of diagnostic tool types are decisive in this cultural attribution. In addition, Aurignacian lithics were found to be associated with bone, antler, and ivory points, either of the split-base type or of the round-base (Mladeč) type, in several caves, particularly in the rich assemblages of Potočka zijalka cave, Croatia (Brodar and Brodar 1983). The association of early modern humans with the Aurignacian industry is attested at Mladeč caves, Moravia, dated recently to 35 ka (Svoboda, van der Plicht, and Kuželka 2002), and Vogelherd cave, south Germany, at 31.9 ka. On the other hand, the recent dating of the human frontal bone from Velika Pečina cave,

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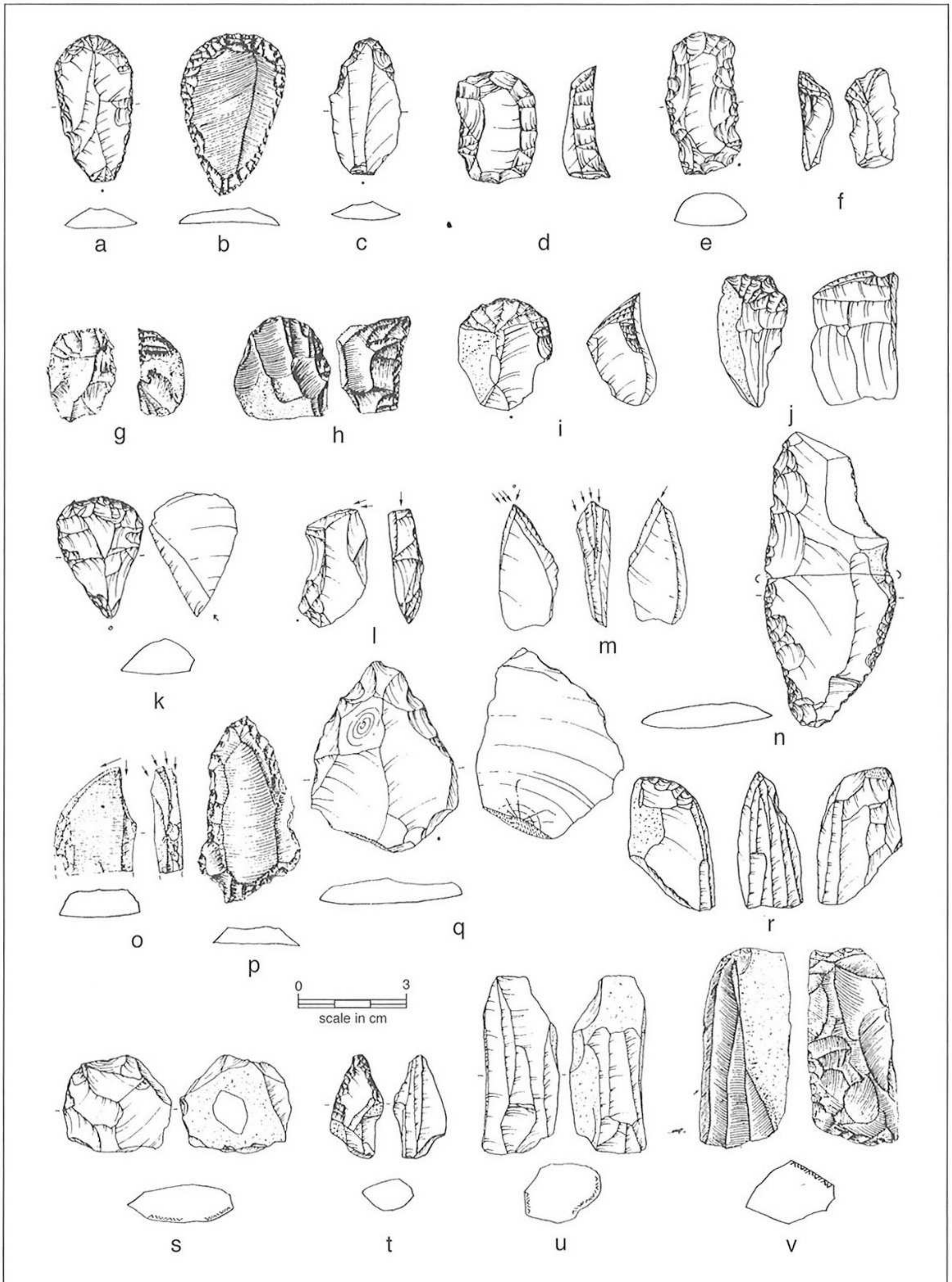

Figure 1.5
Selected Aurignacian lithics from Ss-II surface collection. (Items b, g, h, o, p, and v after Valoch 1954a. All other drawings by Z. Nerudová.)

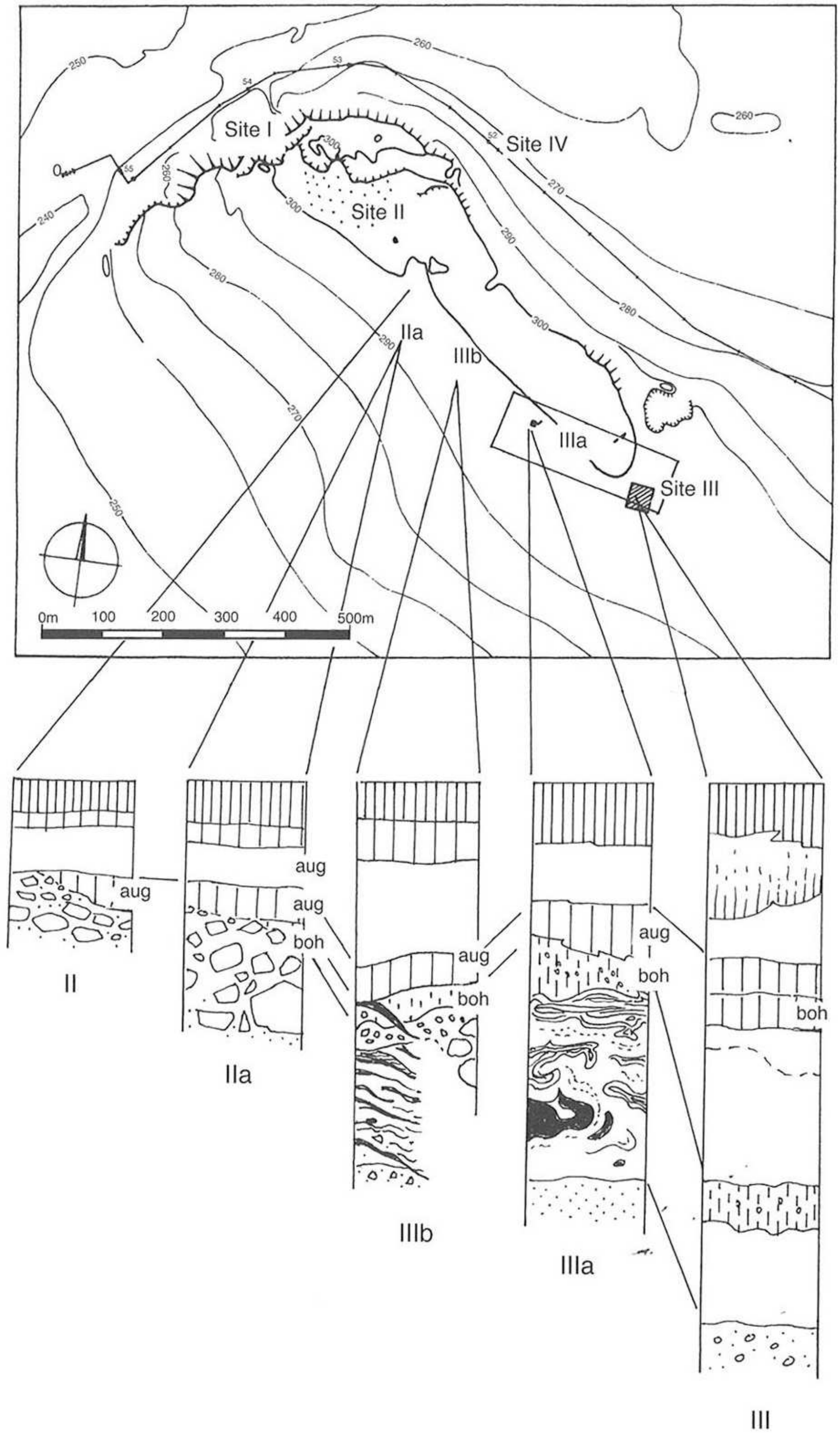

Figure 1.8
General plan of Stránská skála and the stratigraphic correlation scheme of the main trenches, 1982–1999 (Svoboda 2000: fig. 1). The numbers II–III correspond to the individual sites at Stránská skála (boh = Bohunician layer, aug = Aurignacian layer). See appendix B for a detailed stratigraphic description.

PALAEOLITHIC OF THE MORAVIAN KARST (CZECH REPUBLIC)

Neruda Petr

The human being was fascinated by caves from the very beginning of his evolution. He was using them in various ways, very often he alternated with other animals especially with predators. He left waste there, which was a side-product of both utilitarian and non-utilitarian practice and he unwittingly built „monuments of the human culture".
The re-exploration of both biological and cultural evolution was focused on caves and overhangs, because those places were more easily found and produced a great deal of valuable knowledge for many branches of science. An intensive scientific interest in the development of our culture started around the mid 19th century, when we may date the first important discoveries of the cave space (research of J. Wankel, K. J. Maška and others). It is an undoubted fact, that exploration of caves has brought clues about our ancestors and it has significantly contributed to the forming of a modern science methodology for many scientific disciplines. The early interest in caves also brought some features, however, which are supposed as negative today.

Deficient documentation of spacial structures, selection of finds, simplified stratigraphy and other problems are very common. Because of this, many important archaeological events were not properly recorded and their reconstruction is very complicated, even impossible.
Reconstructing the use of caves by Palaeolithic humans, we must also consider natural processes, which have influenced the preservation of archaeological and palaeontological items. We deal with different post-depository impacts related to solifluction, cryogenic action, colluvial and fluvial sedimentation and weathering. Another natural factor is animal activity, especially concerning the presence of predators that found a suitable space for their burrows in caves. Alongside these cavebourne factors, there is the no less-important geomorphology of the karst landscape in Moravia. The low proportion of caves used, for example in the Moravian Karst, certainly relates to the V-shape of cold valleys, limited number of water courses and the absence of a major river in the karst region.

The Lower Palaeolithic

There are no preserved sediments of the early middle Pleistocene phases in the caves of the Moravian Karst, and thus there is no evidence of human presence during the Lower Palaeolithic in this region. There were originally some small caves on the Jurassic limestone hill of Stránská Skála on the southern edge of the Moravian Karst, nowadays mostly destroyed by quarrying, where a rich Cromerian fauna, stone artefacts and fragments of burnt bones were described (Musil ed. 1971; Musil et all. 1995) (Musil - Valoch 1968). Recent research in 1996-1998 confirmed the existence of chipped artefacts both from local cherts and quartz stones together with Cromerian fauna. Burnt bone fragments were found in significant numbers (Valoch 2003). Thus we may suppose that hominids populated small caves at Stranská Skála during the Cromer period.

The Middle Palaeolithic

Evidence in caves for the presence of our ancestorsis more common in the Middle Palaeolithic. In Moravia, however, major sites are scarce and practically only one of them - Kůlna cave - offered a stratigraphic sequence, which may be compared through its content to other sites of western and eastern Europe (Valoch 1988a).

While reconstructing settlement strategies we must consider first of all the distribution of karst areas. If we work only with reliable and cogent data sets, it is astonishing that not more than two karst areas of all those available were used in Moravia - the Moravian Karst and the Štramberk Karst. There are only three caves from these areas with statistically valuable collections of Middle Palaeolithic material (Kůlna, Šipka and Čertova Díra)! Checking for the criteria that might influence the choice of cave for a longer stay in Moravia, we may use Kůlna cave with the most complex stratigraphic sequence as an example (Valoch 1988a). Neanderthals had to be attracted by the fusion of many convenient factors – a big tunnel cave close to a watercourse situated in a relatively sunny valley with good availability of stone raw material and hunting ranges nearby.

The scattered Moravian Middle Palaeolithic settlement unfortunately does not allow relationships between spatial structures and chronology to be identified. Findings are patchy so far, and this is true especially for the Saalian period (OIS 8-6), which is almost, with some exceptions, not documented in the caves. The situation is not much better with the material from the following last interglacial (OIS 5e).

A larger quantity of data comes from the settlement of the Early Vistula glacial (OIS 5d-3b). This period saw a relatively heavy population of the Moravian Karst and we can probably understand this region as a settlement unit with sites of diverse functions. Unfortunately it is not possible to describe the settlement strategy and real settlement density due to the rather fragmented chronological data necessary for correlation of the different settlement phases. A key position is therefore held by Kůlna cave in the period of the Early Würm. Layer 7a in particular can be characterized as a stabile settlement (Neruda 2003, Tab. 153). Besides this, there are also sites representing short-term occupations (Švédův Stůl cave; Klíma 1962) in the Moravian Karst. The third site type is related with occasional findings in cave filling (caves Drátenická, Výpustek, Pekárna or Balcarka; Valoch 1965c, 1999a, b). The negative factors mentioned above concerning the course of historic research and past use of the cave space may play a significant role here.
Now we have covered the possibility of the settlement strategy reconstruction in the context of karst areas. New research indicates that open-air sites, particularly those close to the stone raw material sources, were used more often than caves, which were generally not the favoured settlement type (Neruda 2003).

Kůlna cave is located in the northern part of the Moravian Karst neighbouring the Sloupsko-šošůvka cave system, where the stream of the Sloupsky creek and its tributaries disappear (Valoch 1988a). Layer 14 represents not only the oldest phase of the settlement in Kůlna cave (Valoch 1970), but also of all caves in Moravia. The explored area in sector D2 was rather small (approximately 5 m2), but the nature of the sediments and distribution of finds throughout the layer suggest it is not an intact archaeological horizon, and all findings are placed in the secondary position. Neither archaeological finds nor the sediments are absolutely dated but, based on interdisciplinary analyses, the cave use may be correlated to OIS 6 or at youngest to the beginning of the last interglacial (OIS 5e). Pollen analysis (Doláková 2002) describes few tree species and a high presence of steppe elements in layer 14. Considering the facts, K. Valoch (2002) characterized the environment of layer 14 as a mild steppe ecosystem where elements of the cold Riss glacial are still present, alongside some warmer elements.

At this time, the Neanderthals used only the cave entrance to the rock step, which made a rather high barrier preventing inhabitation of the cave interior. It seems the Sloup Stream occasionally drained directly into the subterranean cave system. The economy of raw material use was mainly based on processing of local materials (quartz, wacke, quartzite) and occasional use of raw materials from farther away (spongolite). The chipped industry (Fig. 1: 1-5), which consists of both subprismatic and Levallois cores (Fig. 1: 1-3), is related to the Moustérian (Valoch 1988a, Neruda 2003).

Our information base is more rich for the following period of the Eem interglacial (OIS 5e) and its fading in the Würm anaglacial. Absolute dating attempts have not been very satisfactory (Patou-Mathis et al. 2005; Rhodes – Nejman pers. com.). In Kůlna cave, this period is especially represented by layer 11, which correlates both technologically and typologically to the Taubachian (Valoch 1984, 1988b). The characteristic feature is the opportunistic use of raw material on a large scale, which is mainly processed using a core reduction strategy (Moncel – Neruda 2000; Neruda 2001, 2003). We documented a significant variability of both discoid (Fig. 1: 6, 8) and subprismatic (Fig. 1: 7) methods. The industry is characteristic by a small dimension. The approach to hunting was probably also opportunistic as we have evidence of species associated with both closed and open ecosystems. The spatial structure of the cave was very simple. Humans again inhabited only the entrance part. Only two fireplaces have been confirmed, which are interconnected by a refitting sequence (Neruda 2003). The use of osteological material during flake production is quite interesting (especially soft-hammers). Generally we can describe the Taubachian hunters´economy as opportunistic but with some progressive features, which appear more strongly during the Vistula period (intentional importing of rock crystal over long distances; Neruda 2001).

The next dominant settlement phase is related to the Micoquian, which is best documented in layers 9b, 7c, 7a a 6a (Valoch 1988a; Neruda 2003; 2005). The C14 date 45 600 BP for layer 7a can be taken as classic (Mook 1988, cf. Rink et al. 1996). The raw material variability decreases in favour of the spongolite which climbs, in some cases, over 75 %. A certain level of the technology standardization can also be observed (only two types of the discoid (Fig. 1: 12) method as well as the prismatic (Fig. 1: 13, 14, 15) method). The development of bifacial shaped tools (hand-axes (Fig. 1: 17), bifacial backed knives, leaf-shaped points, bifacial side scrapers), which are supplemented by diverse types of combined side scrapers on flakes (Fig. 1: 16), are important for the next progression. We observe a kind of specialization in the choice of hunting game, but that fact is probably connected to a general decrease of species diversity across the available ecosystems. Even so, it seems there was a development in the standardization and logistic economical behaviour. The cave inner space was gradually colonized from the time that layer 7c started its deposition, which might correlate with a climatic cooling. Though it is impossible to determine definitively whether the structures uncovered are contemporary or not, we may say, comparing to layer 11, that the cave division (spatial structure) was more complex. We may also consider, in some cases, structures indicating peripheral non-utilitarian activity; for example a cavity in the right wall of sector F, layer 7c, where three mammoth tusks were stored, or an interesting situation on the spot of the Neanderthal parietal bone discovery in sector D2 or an upper jaw in sector E (Neruda 2003).

A cave, ranking among the important ones due to a discovery of a Neanderthal jaw, is Švédův stůl in the southern part of the Moravian Karst. The archaeological survey exposed several horizons with isolated artefacts and traces of simple fireplaces (Klíma 1962). The oldest settlement is matched with the Eem interglacial, but the whole Middle Palaeolithic complex might originate in the Würm anaglacial (Valoch 1996). Clear spatial structures were not successfully identified in situ and, based on a fauna analysis, the settlement seems to be only episodic and alternating with hyenas, which used the cavity as a borrow.

The Beginning of the Upper Palaeolithic

The beginning of the Upper Palaeolithic witnessed a significant change in the use of the karst areas as settlement units. In fact we do not know any site of a base camp type. The majority of evidence rather suggests short term residence in caves for hunting purposes.

This trend is the most surprising in the Szeletian. The theory of genetic continuity forthe Szeletian seems to be reasonable in the territory of central Europe, and such a withdrawal from the use of karst areas is surprising.

In the Moravian Karst, we know only of isolated findings coming from old researches, which are not connected with intact archaeological layers, and thus it is almost impossible to determine in more detail the character of the settlement. Rytířská Jeskyně ranks as the most famous site with a huge 45 m hight entrance over the bottom of Suchý Žleb (Valoch 1965b). The cave content included at least two leaf points (Fig. 2: 4-5; Simon 1944; Skutil 1961). It is possible to relate also other items from the cave deposition to this settlement period, but in any case the cave use was rather for only a short time.

The same situation is seen in the case of Pod Hradem cave, where two leaf-shaped points were found (Fig. 2: 2-3). One of them was stratigraphically located under the layer of the Aurignacian (Valoch 1965a). An indistinctive small leaf-shaped point comes also from Křížová cave (Fig. 2: 1); it might be related to a quartz industry. Neither chronological nor cultural context is clear in this case (Valoch 1960).

There is another and more complicated matter of the Aurignacian layer identified in Býčí Skála. The traditional view explains the industry on local chert to be a unique phenomenon produced just by settlers at this cave. More recent analyses of original reports and preliminary technological studies instead indicate, that even this "archaic" part may be a result of Magdalenian settlement (Oliva 1995, 1996). An episodic use of Pod Hradem cave, likely in relation with a bear hunt by Aurignacians, is supposed according to radiocarbon dates on charcoals and burnt bones that fall to the time range between 33.330 – 28.200 uncal. BP. Only a limited number of findings (lithics) was uncovered (Fig. 2: 6-7; Valoch 1965a).

The Gravettian

The Gravettian settlement of Moravian caves is, comparing for example to Germany, rather sporadic; we know typical Gravettian findings only from Kůlna cave. The explanation, why the Gravettian hunters did not use the karst area, may underlie in hydro-geomorphological conditions. Moravian karst areas lie away from major river streams, which Gravettian settlement was bound to. Big river valleys offered better climate conditions for vegetation to grow and thus for hunting game. The Kůlna cave settlement represents in this way a unique occurrence, probably in the context of the Brno settlement unit.

The intact cultural layer was located especially in sector J by the west wall inside the cave, and it is represented by almost a hundred chipped stone artefacts. Endscrapers, retouched blades and blade points dominate among them (Valoch 1988a; Oliva 2002). Even a bone industry was found, while some pieces carry traces of ornamentation (Fig. 2: 13-16), which correspond to the traditional patterns as we know them from the Pavlov settlement unit or from Předmostí by Přerov.

The cave entrance (sectors A-D) was probably also inhabited, but we were not able to capture an adequate layer with a lithic industry (in this area there is present the Micoquian industry in the loess with limestone debris and Magdalénian findings in the same loess

horizon with lower debris content). Radiocarbon dates are similar to ones obtained from sector J and both data sets going back to the late phase of the Gravettian (Mook 1988).
Two dates gained from charcoal originating in Pod Hradem cave fall to the same period between 21.500 – 26.830 BP (Valoch 1965a). Considering the findings it is impossible to specify the cave use in more details. The use of Křížová cave, in southern part of the karst, was also episodic. Two mammoth artefacts were found there - one cylindrical point (Fig. 2: 12) and an ivory slice in a shape of a ring (Fig. 2: 11; Valoch 1960).

The Magdalenian

The caves of the Moravian Karst were utilised more towards the end of the Upper Palaeolithic, with the appearance of the Magdalenian culture. At this time human dependence on local geomorphological conditions is manifested very strongly, reflected in the high population density in every single karst valley. In a wide, sunny and relatively shallow valley of the river Říčka in the south Karst, traces of human presence were found in every tiny cave, and spatially convenient caves were also populated in somewhat deeper valleys that maintained a friendly microclimate, for example Křtinské Údolí (valley) in the central part. On the other hand, in the northern area consisting of rather narrow, deep cut and cold gorges, Magdalénian settlement was limited to caves in wider basins in vicinity of villages Ostrov and Sloup. Some apparently convenient caves haven´t so far shown any traces of significant occupancy in either gorge (Suchý and Pustý Žleb). Some settlement evidence was also found in isolated caves in limestone zones north of the Moravian Karst. Humans also rarely settled in open-air locations at the base of steep walls - Ochozská cave in Říčky or “Kolíbky” near the Jedovnice village. There were sites located by the village of Mokrá (Škrdla 1997, 1998, 2002; Škrdla – Kos – Přichystal 1999) on the edge of the limestone massif of the Moravian Karst on a karren surface. Here, the only large settlement is situated on the higher terrace outside the karst area above the river Svitava in Brno-Maloměřice (Borky I; Valoch 1963), some 8 km southwest of our most important site - Pekárna cave in the valley of Říčka.
Based on this geographical zoning, natural groups always rose with one home base and several smaller sites nearby. In the southern part, it is Pekárna cave, Býčí Skála in the centre and Kůlna cave in the north of the Moravian karst. Each of them has a territory of a sufficient size as a hunting range; they could exist, theoretically, at the same time. Actually, the Magdalenian settlement covers, according to the currently know uncalibrated radiocarbon dates, a period of two thousand years between 14 000 and 12 000 BP (Valoch 1974; Valoch – Neruda 2005).

The natural karst environment may be visualized as a landscape with considerable differences between rather open steppe plateaus, wide valleys covered with undemanding woody species and narrow cold gorges. Due to the rather small area of the karst, it was possible to hunt in other neighbouring slightly different biotopes in all three parts. The predominant hunted animals were reindeers, with horses the second most important prey. Other species of big game appeared sporadically. There was also a high presence of rabbit remains in Pekárna. We know almost nothing about the inner spatial structure of the cave shelters, as the main research was done between the end of the 19th century and the first two decades of the 20th century. Attempts have been made to reconstruct at least the fireplace locations mentioned by authors of the excavations in Pekárna (Svoboda 1991) and Kůlna cave (Kostrhun 2005). An important Magdalenian centre rose in Moravia. Stone industries are chipped mainly from erratic flint coming from southern Poland with a lower percentage of flint from the vicinity of Kraków and local raw materials with distinctive rock crystal. Differences among the bigger collections from various sites can be found typologically, although no chronological relationships can be distinguished (Valoch 2001). Generally the assemblages are no different from the Magdalenian industries of neighbouring areas of central Europe or the classical French sites.

The characteristic Magdalenian features are tools, weapons and art items made of reindeer antler and various bones (Valoch 2001, 2010). Those items were found in significant number only in Pekárna cave; their presence is rare or unique in other caves. The artefact-types include cut reindeer antler (Fig. 3: 15) mainly shaped as antler points with a chisel-like cut base (Fig. 3: 20), eyed needles (Fig. 3: 19), scrapers/polishers in different shapes (Valoch 2001, Abb. 20-24; Taf. 6, 7; 9:1, 5-8) and rare drilled parts of antler (Fig. 3: 18). Three reindeer antler harpoons were also found at Pekárna, the only ones in Moravia (Fig. 3: 21; Valoch 2001, Taf. 8:1-3). As ornamental items, we identify a drilled disk made of jet coal (Fig. 3: 10), various tertiary shells(Fig. 3: 11), isolated animal teeth (Fig. 3: 9) and more often pendants made of pebbles or fragments of Kulm slate (Valoch 2001, Taf. 2:1-4, 9; Abb. 21:10). Amber (Fig. 3: 12), hematite (Fig. 3: 13) and an iron concretion in the shape of a double ball also served as ornamental items (Valoch 2001, Taf 1:11). Art items are, in proportion to the scale of the settlement and the number of sites, abundant and of a high quality; many of them rank as unique in Europe. They are almost entirely engravings serving as ornamentation of different artefacts made of bones or antler and consist of short grooves or their combination (Fig. 3: 14, 16, 17). Realistic engravings of animals are outstanding. There are four anthropomorphic depictions, two which are engraved, and two statuettes. Special features are engravings on pebbles of Kulm slate. Many grooves were formed during processing activities (soft-hammers and similar; Valoch 2001, Abb. 19:4; Taf. 1:1-10; 2:5-8; 3:8), while some pebbles are decorated by rows of short grooves or in a grid pattern (l. c. Taf. 3:1, 3). More complicated geometric groove compositions might have some meaning hardly apprehensible today. Some symbols (sexual? in the sense of A. Leroi-Gourhan 1965) might express patterns on both sides of a pebble from Býčí Skála (Fig. 3: 4). Another motif is some sort of bird (?) on the stone pebble (l.c., Taf. 4:7), a plant on a ivory stick (Fig. 3: 16) and a rendition in relief on another stick is usually also compared to some vegetal structure (Fig. 3: 15).

Many engravings may be interpreted as symbols of a phallus (Valoch 2001, Taf. 4:1-9), while the engraving on one pebble is identical with the rendition on a smaller "spoon" or "dagger". Female forms of "Gönnersdorf type" are hidden in the crisscross grooves on one pebble and a slate plate (Valoch 2001, Abb. 26:9, Taf. 14:2). Two quite different figures belong to the female images: fragmental "Petersfels type" made of ivory (Fig. 3: 5, 7) and a bone stick-pendant with schematic breast (Fig. 3: 6) (Valoch 2001). There are four artefacts of European significance in Pekarna cave. Bison (Fig. 3: 1) and horse (Fig. 3: 2)(possibly chamois – cf. Svoboda 2006) figures are finely engraved on two horse ribs. "Spoons" or "daggers" covered with engravings on both sides and made of horse mandibles are extraordinary in the morphological meaning (four horse heads, bison and saiga head and probably some sexual symbols; Leroi-Gourhanem 1965). The engraving process and the composition on artefacts is so similar that together, they give the impression of being formed by a single artist (Valoch 2001). The only wall painting is of a cervidae(Fig. 3: 3), discovered by M. Oliva and made in a black colour in Býčí Skála cave (of uncertain age Oliva 1995; alternative dating cf. Svoboda et al. 2005a, b). The Moravian Magdalenian ranks by its art production among the most important centres in Europe.

Late Palaeolithic

Kůlna cave shows the Magdalenian development to the next period of the Alleröd and the Upper Dryas (Valoch 1988a). The stone industry of this Epimagdalenian layer used smaller sized items (Fig. 3: 24-30), but typologically it maintained many similarities with the Magdalenian. Bone artefacts were rare (Fig. 3: 31); spear points were of a similar shape as before. The environment changed significantly; cold-adapted steppe fauna such as reindeer disappeared and Holocene fauna such as deer, moose, wild boar and beaver mastered the scene. It is one of the rare examples of Magdalenian development in the late Pleistocene period in central Europe.

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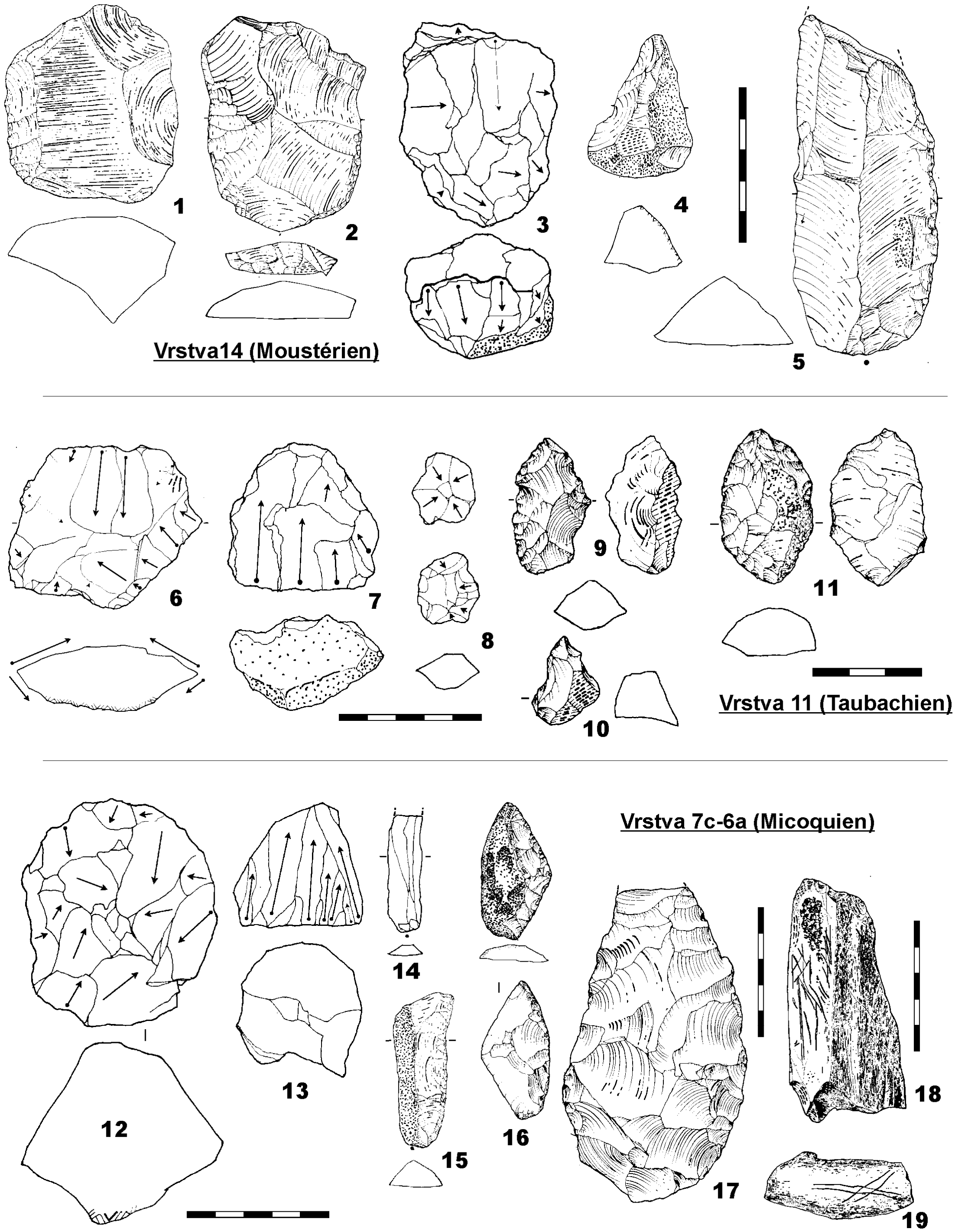
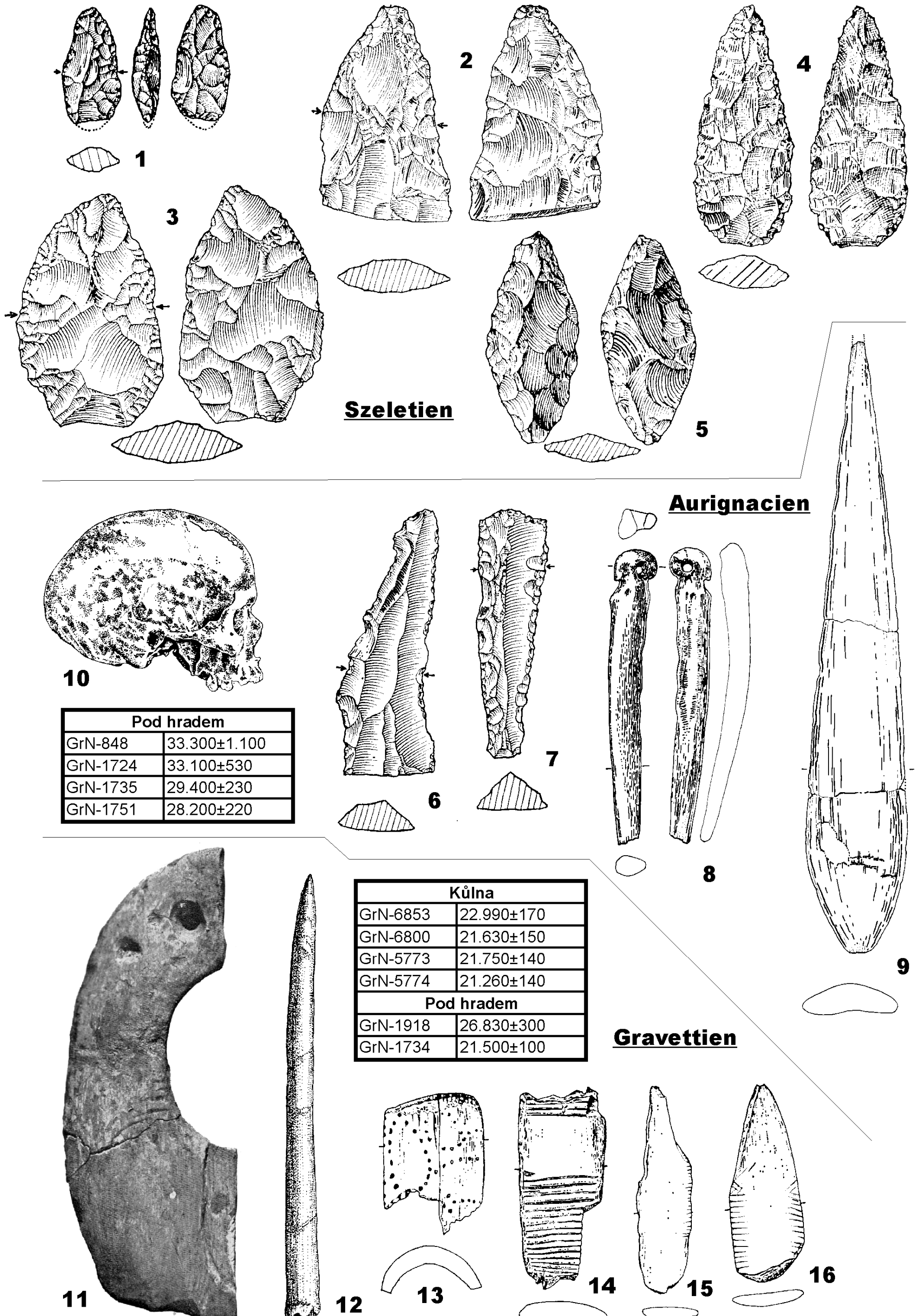


Figure 1: Middle Palaeolithic artefacts from the Kůlna cave (Valoch 1988, Neruda 2003). 1, 3 – Levallois core; 2 – retouched Levallois flake; 4 – archaic point; 5, 14 – blade; 6, 8, 12 – discoid core; 7 – subprismatic core; 9, 10 – archaic points, 11, 16 – side scraper; 13 – prismatic core; 15 – side scraper on a blade, 17 – biface, 18 – bone retoucher; 19 - symbolic mark (?) on a bone. Relative scale



Pod hradem	
GrN-848	33.300±1.100
GrN-1724	33.100±530
GrN-1735	29.400±230
GrN-1751	28.200±220

Kůlna	
GrN-6853	22.990±170
GrN-6800	21.630±150
GrN-5773	21.750±140
GrN-5774	21.260±140
Pod hradem	
GrN-1918	26.830±300
GrN-1734	21.500±100

Figure 2: Szeletian (1-5), Aurignacian (6-10) and Gravettian (11-16) artefacts from caves. 1-5 – leaf points (1 – Křížova cave; 2, 3 – cave Pod hradem; 4, 5 – Rytířská cave); 6, 7 – blades (cave Pod hradem); 8 – pendant; 9 – Mladeč point (Mladeč caves); 10 – skull Mladeč 1; 11 - ? from a mammoth tusk slice; 12 – cylindrical point; 13-14 – decorated bones and mammoth tusk fragments. 1, 11, 12 – Křížova cave (Valoch 1960); 2, 3, 6, 7 – cave Pod hradem (Valoch 1965a); 4, 5 – Rytířská cave (Jarošová 2002); 8-10 – Mladeč caves (Teschler-Nicola ed. 2006); 13-16 – Kůlna cave (Valoch 1988). Relative scale.

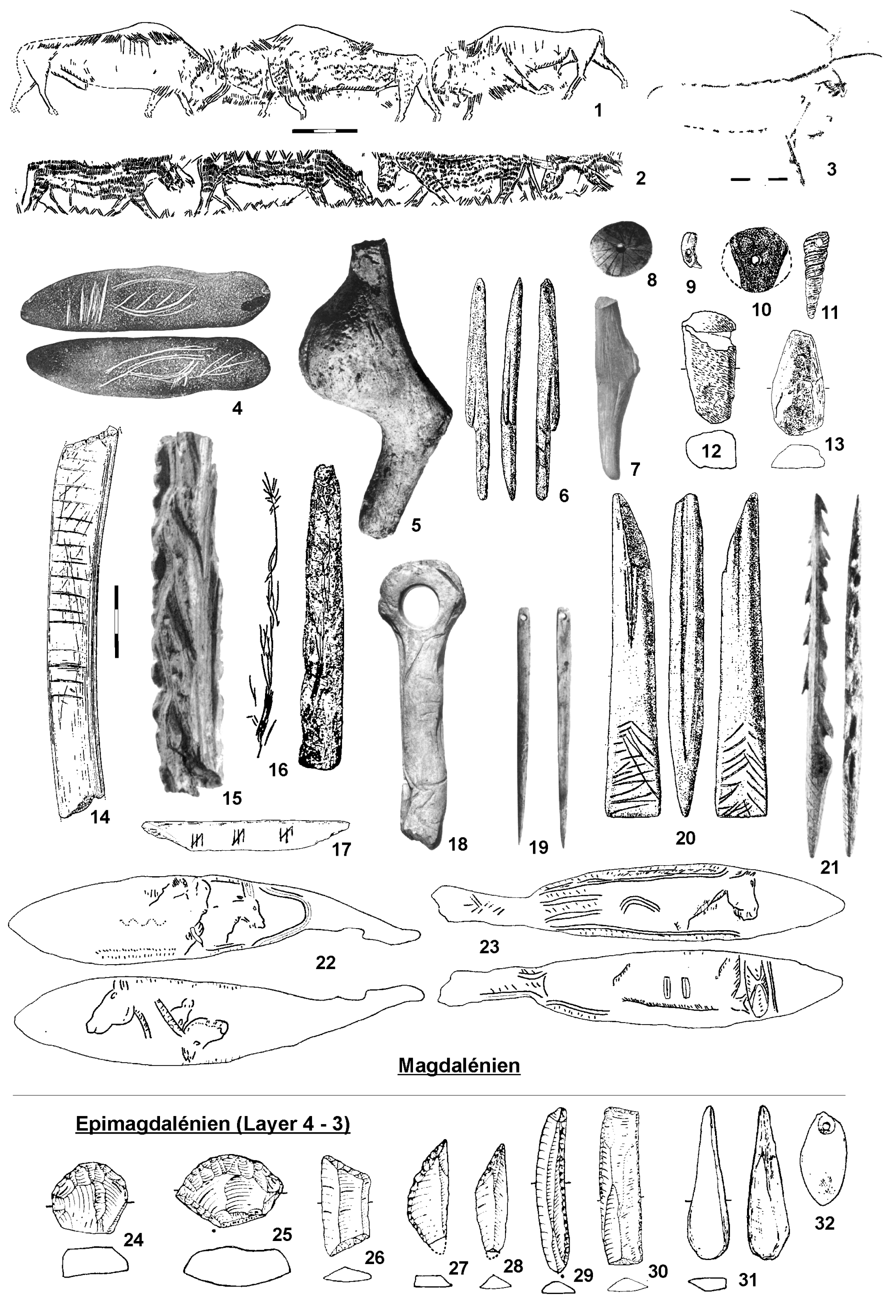


Figure 3: Magdalenian (Valoch 2001) and Epimagdalenian artefacts (Valoch 1988). 1, 2 – horses and bisons on horse ribs; 3 – black painting of cervid; 4 – symbolic (?) engravings on a pebble; 5 – Gönnersdorf venus from a mammoth tusk; 6 – anthropomorphic (?) pendant; 7 – pointed pebble; 8 - 9, 10 – pendant; 11 – tertiary shells; 12 – amber; 13 – hematite; 14, 17 – numerical (?) marks; 15, 16 – carving and engraving; 18 – perforated baton; 19 – needles; 20 – point; 21 – harpoon; 22-23 – knives from horse mandibules; 24, 25 – end scrapes; 26 – trapeze; 27 – segment; 28 – point; 30 – truncated bladelets; 29 – backed bladelets; 31 – point from a boar tooth; 1, 2, 5, 14-16, 18, 19, 21-23 – Pekárna cave (Valoch 2001); 3, 4 – Býčí skála cave (Valoch 2001); 6, 20 – Rytířská cave (Valoch 1965b); 7, 8 – Křížova cave (Valoch 1960); 9 - Adlerova cave (Valoch 2001); 10 – Ochoz (Valoch 2001); 11-13, 17 – Kůlna, layers 5-6 (Valoch 1988); 24-32 – Kůlna, layers 3-4 (Valoch 1988).

KŮLNA CAVE (CZECH REPUBLIC) – AN OVERVIEW

Petr Neruda

History

In the 2nd half of the 19th century in Moravia a deeper interest was devoted to the past of man and his culture during the course of diluvial time. One of the first caves in which excavations were started was Kůlna Cave at Sloup, where Jindřich Wankel found stone implements together with bones of extinct diluvial animals in the year 1880. In the following years up to the year 1913 vast excavations were undertaken at Kůlna, realized by Martin Kříž and Jan Knies. Between the two wars there were no activities in Kůlna, but during the course of the Second World War the cave was heavily damaged as it seemed to be a suitable place for the construction of a factory safe from air bombing. The surface of the cave sediments, originally inclined from the northern entrance to the southern one, was levelled to three stages (in the left part) or four stages (in the right part), a height difference being always about 80 cm. Up to that depth the sediments were removed before each stage and dumped in front of the cave. The result was a terrace area covered with a 20 cm thick concrete layer with machines on it; both the entrances were closed with thick concrete walls. The factory was used till the end of the war. In 1945 the wall In the southem entrance was removed, the machines were dismantled and the cave was deserted.

In 1961 the proposal of the Anthropos Institute of the Moravian Museum for the systematic research of the cave was approved. The research was planned for the period of 15 years and it became a part of the state program of basic research coordinated by the Archaeological Institute of the Czechoslovak Academy of Sciences (today Czech Academy of Science).

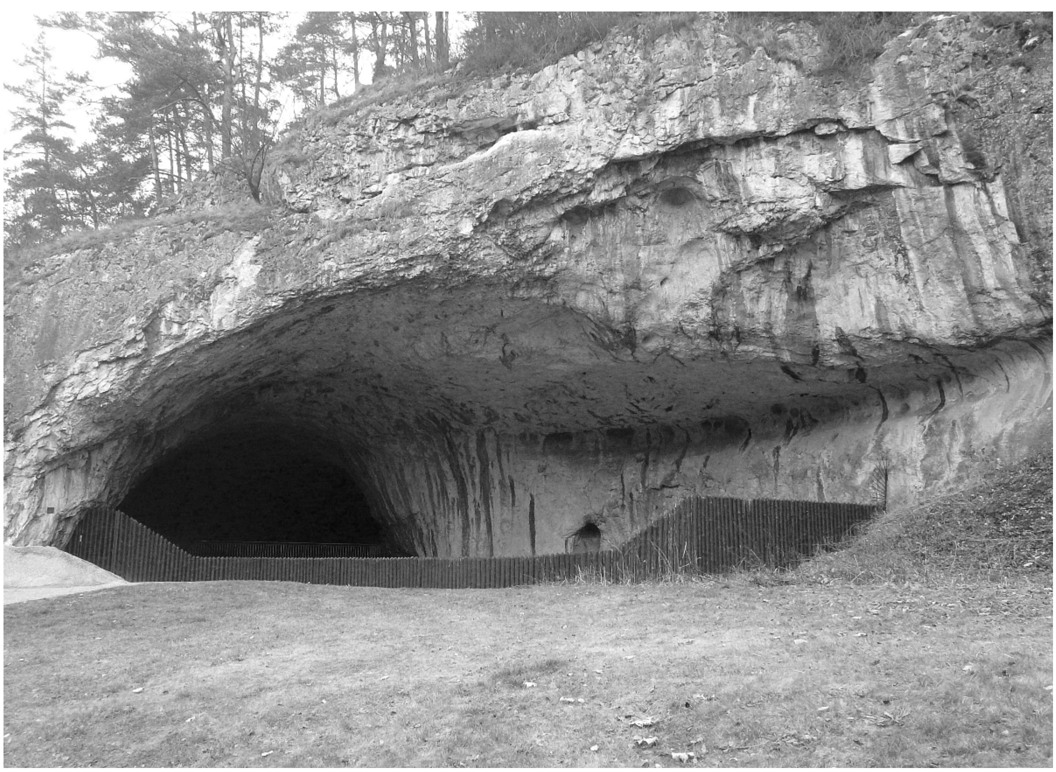


Fig. 1. Southern entrance of Kůlna Cave (foto L.Lisa)

Position of site

The Kůlna Cave (Fig. 1) occurs in the cadastre of the village of Sloup (the district of Bmo), about 30 km to the north of Brno in a northern part of the Moravian Karst, almost at the boundary of Devon limestones and Kulm sediments. It is a tunnel-shaped cave, 87 m long, 25 m wide at maximum and about 8 m high (Fig. 2). The research concerned only the area in front of the southern entrance to a distance of 15 m, the whole of the front part of the cave at the southern entrance, and a considerable portion of the middle part to a distance of 50m from the southern entrance.

Chronostratigraphy

All the layers were determined by means of macroscopic criteria (colour, texture, debris content). On the basis of chronological conclusions they can be divided into four cycles: I - layers 1-6, Holocene, Late and Upper Würm; II - layers 6a-9b, Lower and Early Wůrm; III - layers 10-13a, Eem lntergiacial; IV - layers 13b, 14, the end of Riss (Fig. 3). The complete profile is possible to describe only in the cave entrance. There were preserved layers from 14 – 7d. The inner space of the cave was first occupied in layer 7c. Inside the cave K. Valoch distinguished several sub-layers. The youngest micoquian layer is originally marked as 6a in the entrance and 6b in sectors G and H. Layer 7a is divided to sub-layers 7a, 7a1, 7a2 etc.

Late Glacial

From the lnventory of layer 3 we have selected 17 stone implements typologicaily resembling the Final Palaeolithic - Mesolithic). Their affiliation to the Upper Epimagdalenian can, however, hardly be eliminated. Also present were an awl made of a boar canine tooth and an oblong-shaped, pierced, bone thin plate found immediatelly under the flowstone layer on a rock wall in an alcove in m2 24/N.

Epimaqdalenian

The inventories of layers 3 and 4 differ only slightly. It is flint that is prevalent among raw materials (south Polish and erratic flint); extraordinary finds are two splinters of porcelanite, a splinter of obsidian and a blade made of Swieciechów flint. The most prevalent implements are backed bladelets and small flake scrapers. In layer 4 there were three rectangles and a trapeze. Bone artefacts were quite rare: fragments of points, awls, polishers and cut parts of stag antlers. The origin of openings and pits in several bones is not clear enough, in two cases it would be possible to speak about injuries at hunting. Layer 4 is characterized by longitudinally cut metapodia of a stag and an elk, and a find deserving special attention is a gripp made of the epiphysis of an elk tibia.

Maqdalenian

There are three Magdalenian inventories: from layer 5, layer 6 and the space of an isolated fireplace in the central part of the cave. Differences among them are negligible. The prevalent raw material is again exotic flint. An exceptional find is a fragment of an obsidian blade (layer 5). Backed bladelets are the most abundant artefacts, while the percentages of scrapers and burins are almost the same. The number of borers is much higher in comparison to Epimagdalenian. The industry is generally higher, more bladelike than in the Epimagdalenian, though scrapers of layer 5 are mostly on flakes. Bone products are very rare for the Magdalenian: fragments of points and needles, an awl, a polisher, cut parts of reindeer antlers and retouchers. Another find is a slate pebble cut into the shape of an awl (layer 5). Pieces of amber were found in layers 5 and 6, sporadically a perforated fossil shell (layer 6). In layer 5 there was a flat rolled pebble of graywacke; its natural shape resembling a fish was suggested, with two transverse grooves and a pit in the position of an eye. The stone as well as the bone industry of the Epimagdalenian reflects Magdalenian traditions. In layer 4 the first geometric shapes of microliths come into existence and from this standpoint it is possible to consider the "Mesolithic" implements of layer 3 to be a part of the Upper Epimagdalenian, and the cultural genesis of the following Final Palaeolithic.

The ecology and chronology of the Magdalenian and Epimagdalenian are chapters with the most striking differences in the results in various branches of science; however, the differences have not been explained and united in a satisfactory way yet. From the point of view of archaeology the position of both the cultures is clear. The Magdalenian appears in the Bølling or the Dryas II and it finishes in the Allerød when the Late Palaeolithic, in this case Epimagdalenian, appears across the whole of Europe. The climax of the Late Palaeolithic goes back to the Dryas III and It continues to the initial phase of the Preboreal. An Allerød age for the Magdalenian and the association of the Dryas III/Preboreal with layer 3 are supported by radiocarbon data. Big fauna, molluscs as well as woody plants (according to charcoals) show the beginning of a postglacial forest fauna and flora already in layer 5, which clearly determines the climatic character in layer 4. At the same time, however, there are still a lot of reindeer surviving in the mentioned period and microfauna is dominated by Dicrostonyx torquatus. Amongst the herbs (according to pollen records) it is possible to observe, for the first time, synantropic elements and among molluscs, both the conches of a subrecent appearance and also one species (Helicella obula) known only as a recent immigrant. The flora and fauna of layer 3 is purely Holocene in character, where the synantropic elements are limited to one species, in case of molluscs, however, both the problematic phenomena are repeated (the subrecent appearance as well as Helicella obula). The interpretation and dating of layers vary as a consequence of different results in the case of individual authors, which could be understood as a tendency to maximum objective evaluating the materiais of their own. The knowledge of a relatively short but, with respect to climatic development, very dynamic period of the Late Glacial and Early Holocene is at the very beginning in this country; Kůlna is the first locality in the Czech Republic where we have obtained, from several layers of one section, archaeological as well as numerous zoological and phytopalaeonthological materials together with radiocarbon data. We cannot be surprised that all the results are not conformable.

Gravettian

The existence of the Gravettian at Kůlna was discovered for the first time while processing materials from previous excavations. A newly obtained assemblage could be supported by two radiocarbon data (about 22,000 uncal. B.P.). The ecological character was milder than in the Magdalenian, which was proved by both the big and small fauna. The period can be chronologicaily interpreted as the Tursac Interstadial. The Industry is not very abundant. Raw materials are represented, in addition to flint, by yellow—brown Cretaceous hornstone (chert). Characteristic features are long blades, some of them modified to make scrapers, then blade points and two points of a Gravette type. As to bone artefacts, it is necessary to mention fragments of ribs with deep parallel grooves and grips meda of epiphyses of various bones; as to ornaments it is possible to find perforated fossil conches and a small lump of amber.

Micoquian

Layer 9b is not very abundant, but represents the first occurence of the Micoquian at Kůlna. From a point of view of ecostratigraphy this layer is important as the last occurence of interglacial elements (for example Dicerorhinus kirchbergensis). The Micoquien layer 7c is the result of a short-term occupation event. From the technological point of view, considerable changes can be identified. There is a decrease in the number sub-variants of the discoid method that embodies one of the main means of obtaining blanks (Neruda 2003, 2005, 52). Perhaps we can consider this phenomenon as the beginning of a standardised production process. The prismatic method is a very distinct method that is comparable to the Upper Palaeolithic equivalents. Fasonage, which produced bifacial supports of typical Micoquian tools such as the backed knife, handaxe, bifacial side scraper etc., is the second method that was used. The Micoquian tools are characterized especially by an asymmetrical cross-section that could be shaped into various forms of functional edges (Boëda 1995). Although the diversity of raw material is still high, it is obvious that Cretaceous chert, which is located 6-10 km away, was preferred. There are also imports from far away – ca. 100 km – but only sources that are located approximately up to 40 km away were economically significant (Neruda 2005). The faunal perspective indicates that the diversity of game species slightly decreases; fauna are more frequent then in layer 11 (Zelinková 1998, Musil 2002). Unfortunately, there is a lack of taphonomic analyses that would provide more data for making more accurate conclusions. However, we see evidence of bone fragments used as retouchers and systems of grooves on the surface of bones again (Fig. 7: 1-9). For all the grooves coming from layer 7c that show obvious organization (Valoch 1980) there is the same problem as in Taubachian cases. Spatial organization of the interior of the cave is very simple, which corresponds to the intermittent use of the cave (Neruda 2003). Substantial changes come with the occupation of central part of the cave because the sediments already covered the rock step (Fig. 6). A cache deposit containing three mammoth tusks that was placed in a narrow rock cavity in sector F is probably the most significant find. The same sector contained a meaningful number of bifacial tools and there is an interesting correlation with bone retouchers in this space (Neruda in prep).

Layer 7a is the main Micoquian layer in Kůlna cave. This layer is very comparable to the Taubachian one in terms of the site function and the length of occupation. If we compare some attributes that may define the nature of the occupation, we can see the similarity between both layers (Tab. 1). Technological changes include considerable standardization of the discoid method (Fig. 4: 12). We can identify discoid cores sensu stricto (Boëda 1993) and sub-discoid cores with hierarchical surfaces (Neruda 2005). Also, the prismatic method exhibits all attributes of the Upper Palaeolithic method of reduction (Fig. 4: 13) and the blades are well comparable with, for example, Aurignacian ones (Fig. 4: 14, 15). Fasonage of the supports remains stable. From the typological point of view, in addition to various side scrapers (Fig. 4: 16) and bifacial tools (Fig. 4: 17) that dominate, there are also hybrid forms that are impossible to classify by numbers in the traditional system developed by Bordes (similar with the Charentian of Quina type). Some types fall within, for example, the category of bifacial backed knives and side scrapers with thinned back. The specialization in Cretaceous chert that forms 78% of the stone inventory is even more evident. Imports from far away are also present but their economic potential is minute. The spatial organization of the cave underwent a substantial change. Few functionally different zones were identified (Fig. 5): the structure in the right part of the entrance is associated with the production of lithics and manipulation with heavy bones, the feature associated with a Neanderthal maxilla, the hearth containing Neanderthal parietal bones (Jelínek 1988), a concentration of bifacial tools (sector E) and the oblong hearth located in the rock recession in sector G2. At that time, the entire cave with the exception of sector J in the northern entrance was occupied. The species diversity of fauna that was hunted decreases. This probably reflects changing climate. Anyway, gregarious species dominate. It means that the main subsistence activities took place in the rolling hill environment, probably above the Svitava River. Sources of cretaceous chert, which was the preferred raw material, are located there as well. The use of bone industry shows attributes that we have already defined.

Layer 6a is well comparable to layer 7c in terms of its nature and functional use of the site. The only difference is that the central part of the cave including sectors E, G, and H was occupied. This shift in occupation may be associated with the cooling of climate and an extension of the cave sediments. The spatial structures are not as complex as those in layer 7a. Technological and typological development continues in the trajectories initiated in layers 7c and 7a. Cretaceous chert is preferred again and imports from far away are missing.

The general ecology of the Micoquian is determined by big and small fauna, because both molluscs and charcoals were found quite exceptionally and they could contribute to completing a view. An Important chronological point is created by a radiocarbon datum for layer 7a (about 45,000 uncal BP). Layers 6a, 7a and 7b came into existence during a cold stadial climate at the end of Lower Vistula Glacial. The fauna in the first two is psychrophilous, steppe. In comparison to them it is possible to consider layer 7c a warm parkland oscillation of an interstadial character (the Kůlna interstadial, according to Musil, may be identical with Moershoofd). In previous early Vistula Stadials (layers 8a and 9a) there was a more temperate climate (temperate stadials with steppes according to Musil), while layers 8b and 9b came into existence at the time of the spreading of forests (perhaps the interstadials).

Fig. 2: Middle Palaeolithic sequence of the cave entrance stratigraphy (Photo L. Lisa).

Taubachian

There is much more information about the Taubachian series of layers 11 (end of Eemian Interglacial and/or beginning of Vistula Glacial). Archaeological excavations of this part have produced 13 000 stone artefacts (Valoch 1988a, b). Blanks were extracted mostly from discoid cores (Fig. 4: 6, 8). However, there were several sub-variants within the frame of this volume method that reflected the quality of stone material and enabled extraction of the maximum number of supports (Moncel - Neruda 2000; Neruda 2001a, b, 2003). The second most important method was the reduction of the sub-prismatic cores (Fig. 4: 7) through the parallel chipping of the oblong supports (Neruda 2003). In both cases, the cores were extracted intensively, so some exhausted cores are 2.5 cm in diameter, even in the case of quartz (Fig. 4: 8). Tools are represented mostly by single side scrapers (Fig. 4: 11), notches, denticulates and archaic points (Tayac, Quinson; Fig. 4: 9, 10). Very interesting is the presence of bifacial tools, rare but analogous to other Taubachian sites in Central Europe (Valoch 1988a, 1995; Neruda 2003). The real significance of bifacial artefacts in the Taubachian is still unclear. In my opinion they represent cores, because of the absence of final retouch on the edge that is typical for Micoquian bifacial tools. The typical feature of this industry is the high diversity of source materials (Féblot-Augustins 1993, 1997; Neruda 2001a, b). Local and regional sources were used most intensively. However, it is important to note that there are also a few imports that came from places 100 km away and in the case of the rock crystal and smoked rock crystal it is evident that Neanderthals visited uninhabited regions of the Českomoravská Highland with a different ecosystem. Artefacts from imported raw materials were used mostly for the production of more complex tools and they are very rare among non-retouched blanks. Fauna found in this cave is highly variable; paleonthological analyses have identified more than 19 species (Musil 2002). Investigation of animal dentin indicates that animals came from both woodland and open environment (Patou-Mathis et al. 2005). Thus, Neanderthals used opportunistically both ecosystems - deep sharp valleys of the Moravian Karst and plains of the rolling hills along the Svitava River. An interesting phenomenon is a high number of soft-hammers that have been identified among the faunal bone fragments (Valoch 1988b). These are not tools with a formal shape as we know from the Upper Palaeolithic but I believe that we can talk about an incipient stage in the development of bone industry or, at least, attempts to use organic material during the process of lithic production. The arrangement of grooves on the surface of other bone fragments suggests possible non-utilitarian practices of Neanderthals (Valoch 1996). Some traces (mostly on tips) indicate the use of bones for processes which are not yet clear (Fig. 5: 4). Only the entrance part of the cave up to the rock step was inhabited. Spatial structure was relatively simple (Fig 5). Two former hearths and accumulations of animal bones and artefacts were recognized. Refittings relate the spaces around two hearths and therefore both structures could be contemporary (Neruda 2003).

The picture of the natural environment is created, above all, by the association of big mammals because samples of microfauna are not numerous and those of molluscs and charcoal only sporadic. An important factor is layer 13a providing a thermophilic assemblage of molluscs indicating the interglacial. It can be considered, together with the basal layers of complex 11 (11c, 11d), to be Eem, and the upper layers (11a, 11b), together with layer 10, to be steppe oscillations of the Final Interglacial. In the Interglacial a stream running into the cave created its bed in the sediment of layer 14 and deposited layers 12a and 12b.

Mousterian with Levallois Method

The oldest settlement of Kůlna cave is connected with layer 14 and probably 13b as well. In all probability, it comes from the final phases of the penultimate – Saalian Glacial. Layer 14 contained ca. 100 stone artifacts (Valoch 1970). In addition to the simple prismatic (subprismatic) method (Fig. 4: 5), flakes were obtained also from Levallois cores (Fig. 4: 1-3). Locally retouched blanks, side scrapers and archaic points (Fig. 4: 4) are presented. The industry can be assigned to the Mousterian. Stone comes from local sources that are not far from the cave. The farthest import so far comes from 21-30 km away. We have almost no evidence of spatial patterning of the material culture in the cave and hunting because only a small area was excavated, and the artifacts were not in situ (Valoch 1970, 1988b; Neruda 2003).

The anthropological findings in the Kůlna Cave (Jelínek 1988)

In the Micoquiam (layer 7a) there were the following bone remains of Neanderthals: a part of a right upper jaw with four teeth belonging to an approximately fourteen-year-old individual (Kůlna I); a part of a right parietal bone (Kůlna II); and three milk-molars (Kůlna III—V). The previous excavations by M. Kříž produced part of a right lower jaw with four teeth of an adult individuum (Kůlna VI), most probably of Magdalenian age. In the Epimagdalenian (layer 3) we found a canine tooth (Kůlna VII) and an incisor (Kůlna VIII) of adult individuals.

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Layer 6b in the site monography (Valoch 1988b) is correlated with Gravettian. Nowadays an analysis of the fine-grained limnosilicities is still in progress. Possible distribution from Hungary has been proposed (Oliva 2000) but a new geological survey indicates the presence of a local raw material source about 5 km from Kůlna Cave (Neruda – Válek 2002, 311).

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BALCARKA CAVE (CZECH REPUBLIC) – AN OVERVIEW

Petr Neruda and Zdeňka Nerudová

Position of site

Balcarka Cave (Balcarova Skála Cave) is situated in the northern part of the Moravian Karst near the Ostrov u Macochy village (N49.37668 E16.75827). Such as other Palaeolithic sites of the Moravian Karst this one is also typical by a position in a relatively open environment between both open terrain of Drahany Highland and the closed ecosystem of karst valleys. Palaeolithic artefacts have been found only in the tunnel-shaped entrance; other parts of the cave system were probably difficult to access.

History

The archaeology of the cave has been known from the end of 19th century. Excavation of the Magdalenian layer was made by J. Knies in 1898-2000. He described 6 hearths in the cave entrance and one bifacial artefact like a side scraper or bifacial backed knife from the related small cave entrance (Knies 1900, 1902, 1928). At the beginning of the 20th century J. Šamalík removed the rest of sediments, mainly from the inner part of the cave and therefore reconstruction of the stratigraphy is very difficult (Šamalík 1936, 1937a, b, 1939). In 2001/2002 the staff of Anthropos Institute made a rescue excavation of the small cave hall called "Museum" where only paleontological materials were uncovered (Neruda – Nerudová – Valoch – Dreslerová 2002). a final excavation was made by the same institute in 2007 when the entrance to the lower cave system was modified and the rest of the sediments were uncovered (Nerudová – Neruda (eds.) in prep). Two sectors inside the cave with in situ sediments were explored (A and B, see Fig. 2) and one cross-section was also described outside of the cave (probe S0701).

Chronostratigraphy

Reconstruction of stratigraphy is very difficult because of the destruction of a huge mass of sediments by Knies' excavation and speleological works of J. Šamalík. At the cave entrance Pleistocene sediments with Magdalenian artefacts were covered by Holocene layers. The basal horizon could belong to the older sedimentation (lower Vistula Glacial ?). The new excavation of the Anthropos Institute (2007) determined one layer inside the cave situated 1.5 m above the beton floor and dated by 14C to 28,360 ± 140 uncal BP (OxA-18495). It means that if the Magdalenian was present in this part of the cave, it should be situated above, and the lower-most sediments should be dated rather to older part of the Vistula Glacial. A cross-section outside the cave has documented the development of sedimentation from the Late Glacial to the present. The transition between loess sediments of the Glacial and humic soils of the lower Holocene is dated to 10,810 ±45.

Archaeology

Magdalenian

Evidence of the human use of the cave enables us to determine the site as a short-term Magdalenian occupation related to the hunting practices with special focus on the reindeer body processing. Lithics are represented mainly by tools (backed bladelets, end scrapers, borers, burins, splinters etc.), and cores and blanks from the preparation of cores are fewer (det. Nerudová – Neruda). Hard animal material is represented by typical Magdalenian implements such as split base points made from reindeer antler (analysed by J. Zelinková Rašková). Correlation between lithics and antler/bone processing is proven by use-wear analysis of stone burins (det. B. Kufel). J. Knies has distinguished 6 hearths. The most important one was probably hearth n. 2 where a fragment of human jaw with teeth was noted. The relevance of the unique find has been disputed shortly after the publication (see Absolon 1905-1911). The human remains unfortunately disappeared and therefore it is impossible to analyse them. They could be the first anatomical evidence of Magdalenian hunters in Moravia.

Fig.1. – Entrance of Balcarka Cave (photo Z. Nerudova)

Micoquian

More ancient occupation of Balcarka cave is indicated by the single find of a bifacial backed knife or sidescraper from Cretaceous chert (Knies 1926-1928; Valoch 1999). J. Knies found it 2 m inside the second cave entrance, situated on the left of the main entrance with Magdalenian occupation. Remains of cave bears were noted in the same loess sediment.

Osteology

In addition to the faunal remains of the Magdalenian horizon (with a dominance of reindeer), we documented fragments of animals in horizons older than 28 kyr uncal BP in the back part of the entrance. The most abundant are remains of cave bears, especially of young individuals including the neonates. The analysis is still in progress (L. Seitl)

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