SEMRIACH 2013

ABSTRACTS

&

EXCURSIONS

Editor: G. Rabeder & N. Kavcik

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F.A.C.E. AUSTRIA

- **Programme Friday, October 4th 2013:**

  - **9:00** Opening remarks by Ing. Jakob Taibinger, mayor of Semriach and official representatives of the Styrian Government

  - **9:00 – 12:40 Scientific Session 1**

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  - **9:20 – 9:50**
    Nevena J. Cvetković, Vesna M. Dimitrijević
    Age structure of cave bears from Serbia
    Cancelled

  - **9:50 – 10:20**
    Spyridoula Pappa, Martina Pacher & Danielle Schreve
    Preliminary morphological results on Bear specimens from Tornewton Cave, Devon, England

  - **10:20 – 10:50**
    Argant Alain, Griggo Christophe, Argant Jacqueline
    The interest of subfossil remains in a karstic system: Chronotaphonomy in the Nisotte Cave (L'Hôpital-du-Grosbois, Doubs, France)

  - **10:50 – 11:10 Coffee break**

  - **11:10 – 11:40**
    Doris Döppes & Wilfried Rosendahl
    Scanning, printing, analyzing - 3D technique and cave bear research

  - **11:40 – 12:10**
    Elisabeth Leiss-Holzinger , Gerhard Withalm , Christian Gusenbauer
    OCT as innovative non-destructive tomography method
    in studies on fossilized teeth

  - **12:10 - 12:40**
    Axel Barlow, Beth Shapiro, James Cahill, Love Dalen and Michael Hofreiter
    Sequencing the cave bear genome

  - **12:40 – 14:30 Lunch at Hotel Semriacherhof**

- **14:30 – 17:20 Scientific Session 2**

  Moderator: Gernot Rabeder

- **14:30 – 15:00**
  Vesna M. Dimitrijević, Nevena J. Cvetković, Jelena Ćalić
  Pleistocene lions from cave deposits in Serbia

- **15:00 – 15:30**
  Gennady Baryshnikov, Svetlana Baryshnikova
  Late Pleistocene hyenas from cave localities of Asian Russia

- **15:30 – 16:00**
  Lana Laughlan, Gernot Rabeder
  The Gauerblick Cave - A new high alpine bear cave in the Raetikon mountains (Vorarlberg, Austria)

- **16:00 – 16:20 Coffee break**

- **16:20 – 16:50**
  Christine Frischauf, Monika Alscher, Gernot Rabeder
  The problem of Ursus deningeroides from Azé 1 and Herkova jama

- 16:50 – 17:20
  Marián Cueto, Edgard Camarós, Susanne C. Münzel, Luis C. Teira, Hervé Bocherens, Philippe Fosse, Nicholas J. Conard, Pablo Arias
  Cave and brown bear behaviour inside caves: Ethological and paleontological observations with archaeological implications

- **19:00** Dinner at Hotel Semriacherhof


19th International
Cave Bear Symposium
Semriach (Styria, Austria)

Preliminary morphological results on Bear specimens from Tornewton Cave, Devon, England

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Tornewton Cave, part of the Torbryan Caves group located on the south-west side of the Torbryan Valley in Devon (Southwest England), contains one of the most complete late Middle and Late Pleistocene sequences in Britain. Biostratigraphical analysis suggests that the deposits span from MIS 7 through parts of MIS 5 to MIS 2 (Currant, 1996; 1998; Gilmour *et al*., 2007). However, the stratigraphy is complex, with many hiatuses and certain difficulties remain as to the interpretation.

This study concentrates on the morphological and metrical analysis of bear specimens from Tornewton Cave including teeth, metapodials and long bones from all stratigraphical layers from the collection housed in the Natural History Museum in London.

This collection comprises material that was excavated during different periods from 1870 to 1992. Widger was the first to excavate the cave in the 1870s followed by Ogilvie and later, from 1944 to the 1960s by Sutcliffe (Sutcliffe & Zeuner, 1962). Between 1990 and 1992, systematic excavations were undertaken by Andrew Currant who published a comprehensive description of the stratigraphy of Tornewton cave as well as a detailed fauna list (Currant, 1998).

Brown bear (*Ursus arctos*) and spotted hyaena (*Crocuta crocuta*) dominate the faunal assemblage. *U. arctos* remains are mainly concentrated in the “Bear stratum”. Additional specimens were found in the overlying “Hyaena stratum” as well as in the underlying “Glutton stratum”.

The deposits of both the Hyaena and Bear strata have been regarded as being of MIS 5 age, covering the first two temperate substages, MIS 5e (=Ipswichian/Eemian interglacial) and MIS 5c (Gilmour *et al*., 2007; Currant, 1998). The “Glutton stratum” is placed close to MIS 2 (Devensian/Weichselian glacialmaximum) based on direct radiocarbon dating of a wolverine (*Gulo gulo*) jaw (Currant, 1998), although containing some reworked material from older units. A maximum possible age for the Bear Stratum is provided by a Uranium-series date on a stalagmite of 224ka BP (Currant pers. comm. in Schreve (1997).

However, Gilmour *et al*. (2007) suggest that the “Bear stratum” contains material of widely different age and that both cave bear (*Ursus spelaeus*) and *U. arctos* were present in Tornewton Cave, albeit from different chronological horizons. Such late persistence of *U. spelaeus* (until some time in MIS 7) would be at odds with the observations of Schreve (2001) that *U. spelaeus* is replaced by *U. arctos* in Britain between MIS 11 and MIS 9. This is corroborated by Pacher and Stuart (2009), who report that there is no confirmed evidence of the Late Pleistocene cave bear in Britain.

Based on the preliminary morphometrical study presented here, no significant differences between the bear remains from the different layers could be detected and all bear specimens from Tornewton Cave are attributed to *U. arctos*. Further comparison with other European *U. arctos* and *U. speleaus* specimens will shed more light on our understanding of the position of the bears from Tornewton Cave within the ursid lineage.

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The interest of subfossil remains in a karstic system: Chronotaphonomy in the Nisotte Cave (L'Hôpital-du-Grosbois, Doubs, France)

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The Gouffre de la Nisotte (L'Hôpital-du-Grosbois, Doubs, France) which opens in the forest of the plateau of Naisey-les-Granges at 545 m-asl, was discovered by the speleologists of the Canton de Rougemont (ASCR) in fall 2009.

Many bones were above the surface at the bottom of a 15 m well: two brown bears, two cubs, one wolf, three wild cats, one badger, one wild boar, bones of deer and hare, one slow worm , one duck and microfauna.

Very wisely, the speleologists immediately preserved the site by delimiting a restricted area across the cave, without disturbing anything, and they contacted the scientists. The Regional Service of Archaeology of Franche-Comté asked us to intervene. The aim of the expedition supported by this Service in June 2012 was to remove the subfossil material from the surface (no excavation authorized) and to make all necessary observations for a taphonomic study.

Eight 14C-AMS datings were performed as well as a palynological study of sediments in contact with the bones.

This surface layer provides a good idea of how is being formed a fossiliferous layer that could have been discovered further within a palaeontological excavation.

The main insights gained from this operation are:

- in spite of the presence of bones spread on the same level, this layer corresponds in fact to a long chronological period, the remains are not contemporaneous,

- the subfossil bones are far from having the same appearence or the same state of conservation.

- the information given by the pollen analysis of calcite deposited on the surface of a bone of the wolf doesn't match to the 14C dating of the animal,

- the evidence of the presence of a small carnivore - *Martes martes* - is given, but without any bony remains of this species,

- the present entrance of the cave, very difficult, is probably not the former one used by all this fauna.

These observations point to problems which are obviously raised, among many others, in palaeontological excavations, and the Gouffre de la Nisotte provides a good example to approach the reality.

Scanning, printing, analyzing - 3D technique and cave bear research

Doris Döppes & Wilfried Rosendahl

Reiss-Engelhorn-Museen, Mannheim, Germany

The work stages of preparing 3D printed replica are explained by a cave bear skull from Sloup Cave (Czech Republic). The complete skull comes from the collection Gabriel von Max which is stored since 1917 in the Reiss-Engelhorn-Museen in Mannheim (rem, Germany).
The Sloup Cave is part of the Punkva River Cave System in the Sloup Valley which represents a huge complex of domes, corridors and vast subterranean abysses formed on two levels. It is connected with the system of the Amatérská Cave - one of the largest cave systems in the Czech Republic. Part of the cave is open to the public. It is also famous for the remarkable Pleistocene remains, e.g. cave bear and cave lions.
From the restored skull CT scans were made at the University Medical Centre Mannheim (UMM) to get the inner structures of the skulls. Subsequently, the surface of the object was scanned with the 3D scanner Artec EVA to get the original color and the precise surface structure. With these both methods the object are not damaged anyway. Then both data sets were prepared for the 3D printing with the Geomagic Studio software. At this stage one can complete, measure or analyze the inner structures. The 3D color printer ZPrinter 850 including blow-off and cleaning station is very efficient using the screening method and through the distribution of building materials in the 508 x 381 x 229 mm large space. Therefore very thin layers of material can be printed. Not only the composition of the bone parts but also the colour fastness, can be guaranteed by these methods. The Reiss-Engelhorn-Museen (rem) own two 3D scanners (Artec 3D and Mephisto EX) and the 3D ZPrinters 850 color printer.

OCT as innovative non-destructive tomography method in studies on fossilized teeth

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The potential of the high-resolution, non-destructive and non-contact technology of optical coherence tomography (OCT) was evaluated for the two and three-dimensional visualization of dental cement microstructures. The axial resolution of OCT can be as good as 1.7 micrometer, but the penetration depth is material dependent and typically less than 3 mm. The OCT results are compared to those of X-ray micro-3D computed tomography (µ-CT). Exemplified by cave bear teeth, OCT showed its ability as non-destructive tool to count the annual appositional lines consisting of cementum and thus to determine the age of the individual, see Figure 1. OCT scans of mouse teeth show the high 3D scanning ability for small semi-transparent structures.

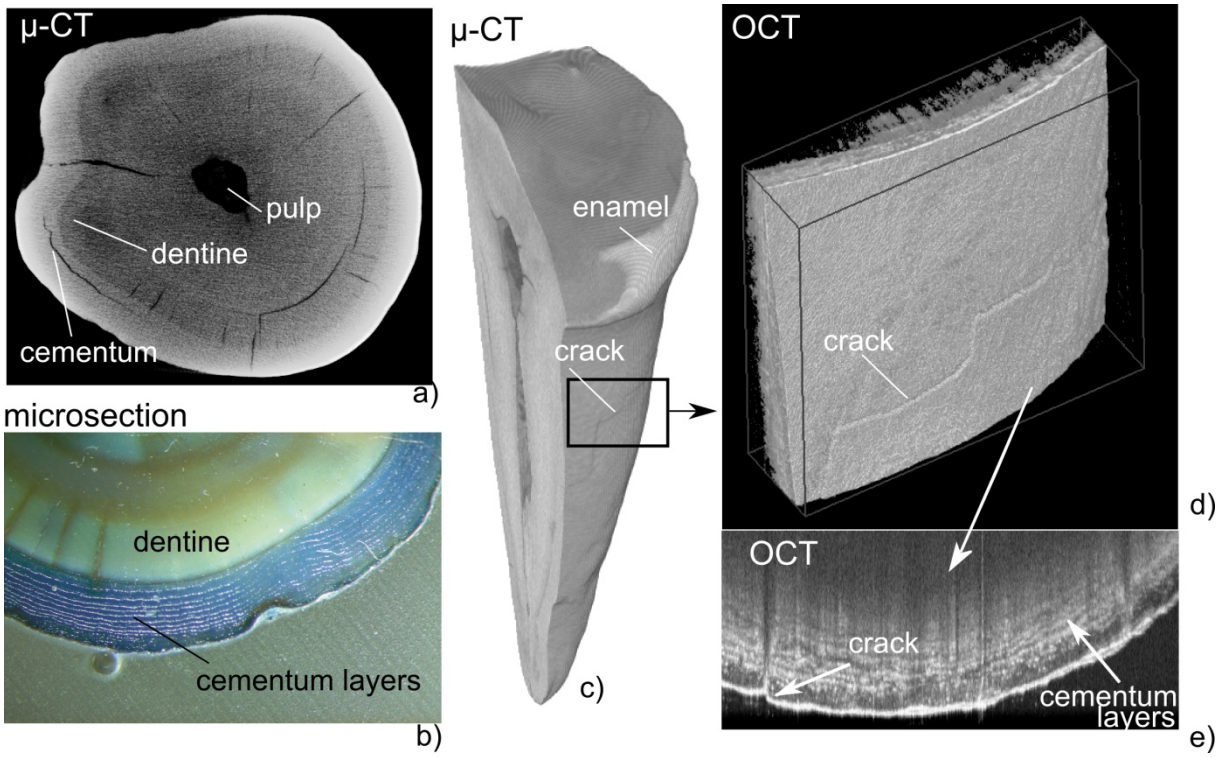

Figure 1: GS 26-1: Mesial root of a right lower M1 of a senile individual of *Ursus ingressus* from Gamssulzen cave (Lower Austria). a) Axial cross-section via µ-CT; b) etched and stained micro section; c) 3D volume rendering of µ-CT data;
d) 3D volume rendering of OCT data (l_c = 1330 nm). e) Corresponding axial cross section via OCT.

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Sequencing the cave bear genome.

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Due to the continued development of DNA sequencing technology, whole genome sequencing is now a relatively straightforward task for extant species. However, for extinct species, whole genome sequencing still presents a major challenge due to the low endogenous DNA content and short DNA fragment size associated with ancient samples. Consequently, although genome-level data has been obtained from ancient samples of hominins at considerable effort and financial cost, no published high-coverage genomes exist for extinct non-human animals. We discuss the feasibility of sequencing the genome of the cave bear, *Ursus spelaeus* together with the genomes of the extant members of the Ursidae for which no genome data exist to date. We present preliminary data demonstrating approaches to circumvent the problem of low endogenous DNA content in cave bear bone samples, and discuss how ongoing work on the brown and polar bear genomes will aid assembly of the cave bear genome from short sequences of degraded ancient DNA. Genome-level data will provide unparalleled opportunities to study the evolution, population genetics, demographics, and extinction of the cave bear. We briefly discuss the potential for such data to provide new insights into cave bear population structure, gene flow and adaptive evolution.

Pleistocene lions from cave deposits in Serbia

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Recently, an almost complete skull of a cave lion, *Panthera leo spelaea* (Goldfuss, 1810), was discovered in the course of speleological explorations in the karst cave Propas' on the Vidlič mountain in Eastern Serbia (Fig.1). The entrance to the cave is a 56 m long vertical passage. It leads into a huge room, 150 m in diameter, appearing to be the largest cave chamber in Serbia. The skull is the best preserved remnant, discovered up to now in Serbia, of the largest felid that inhabited area in the Pleistocene. Previously, rather scant cave lion remains were known from the deposits of a single Middle Pleistocene and several Late Pleistocene cave sites in Serbia.

We present taphonomical observations of the finding circumstances and detailed morphology and morphometry of the skull, as well as description of lion remains from other sites in Serbia. The largest cave lion remains' collection originates from the Risovača cave near Aranđelovac, with four mandibles, and a larger number of isolated teeth, metapodials, carpals, tarsals and phalanges. The Cave above Tabula Traiana, in the Danube Gorges, and Janda cavity at the Fruška Gora mountain in the Panonnian lowland, yielded mostly postcranial bones. A single bone is found in the Cave in red rocks at the Medvednik mountain near Valjevo, few specimens in the Baranica cave near Knjaževac, and few in the Balanica cave in the Sićevo Gorge, the sole Middle Pleistocene site with lion remains. Environmental background of these sites, faunal assemblages, as well as taphonomy of mammals' remains are discussed, in relation to the cave lion role on the predation and competition for food and space with other large Pleistocene carnivores, as well as Palaeolithic people.

Key words: cave lion, Pleistocene, Serbia, Propas' cave, taphonomy.

Fig.1. A cave lion skull in situ in the Propas' cave. Photo Vojkan Gajović. The skull is outlined by white line.

Late Pleistocene hyenas from cave localities of Asian Russia

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Bone remains of the Late Pleistocene hyenas are found in many cave localities of Asian Russia from Caucasus and Urals to Far East, with except of northern regions. In Urals and Siberia hyaena sites occur up to 57°N, whereas in Russian Far East such sites are confined to southern parts of Primorskii Territory (Geographical Society Cave, 43°N). Cave sites of Asian Russia show diversity in their using by hyenas; several caves represent dens with numerous signs of hyena activity and cub remains. Study of geographical variability revealed that the Late Pleistocene hyenas from Urals and Siberia are similar to the West European subspecies *Crocuta crocuta spelaea*; at the same time, animals from Primorskii Territory have been ascribed to another subspecies *C. c. ussurica* (Baryshnikov, Vereshchagin 1996; Baryshnikov 1999). Taxonomic distinctness of the hyena from Geographical Society Cave is confirmed by mtDNA data. Showing its isolation nearly 3.14 Ma (Rohland *et al*. 2005). A morphological resemblance is found between the Russian Far-Eastern hyena and *C. c. ultima* from China, the latter probably dispersed northwards in the warm stages of the Late Pleistocene. The long genetical isolation of this taxon from European/African spotted hyenas provided possibility to assign a species level to it (Qiu *et al*. 2004). Presumably, this species is represented by two subspecies: *C. u. ultima* from the Middle Pleistocene and *C. u. ussirica* from the Late Pleistocene. Different trends were noted in the tooth modification: *C. c. spelaea* shows the reinforcement of trenchant function of cheek teeth, whereas *C. ultima* developed bone-crushing adaptations (Kurtén 1956). Notably, examination of fossil hyenas from Russian Far East revealed their carnivorous dental specialization more expressed.

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The Gauerblick Cave
A new high alpine bear cave in the Raetikon mountains (Vorarlberg, Austria)

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*on behalf of Inatura Erlebnisschau GmbH, Dornbirn,
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The Sulzfluh (2,818m) is a limestone mountain situated on the border of Vorarlberg and Graubünden (Switzerland) and is a highly developed karst range.
Especially the southeastern side of the Swiss territory has a great abundance of caves, of which in two locations “Obere Seehöhli” and in the “Apollohöhle” cave bear remains were found and they have been unearthed during a multiannual excavation (Rabeder 1994, 1995, 2004, Döppes & Rabeder 1997).
The cave bears of the Apollohöhle were assigned to the subspecies *Ursus (spelaeus) ladinicus* Rabeder & al. 2004. The radiometric dating of one of the cave bear bones gave an age result of approximately 55,000 before present (Rabeder 2004)
In 2006, the members of the karst and speleological committee discovered a fossil site during one of their investigations in the deep shafts of the Gauerblickhöhle (2,260m).
Rainer Bösch from Lauterach was the first one who had abseiled into the narrow shaft, and forced his way through one narrow place and found a large amount of bones and teeth on the ground of the last shaft.
According to the regulations the discovery was reported to the local administration, an assessment from the district commission of Bludenz stated that the fossils should be excavated by specialists.
Many years have passed unused because the excavation campaigns that were planned for the fall have been prevented, either through bad weather conditions like snow even in the lower parts, or the working duties of the participants.
In July 2013 it could have been finally realized. Thanks to the initiative of Dr. Georg Friebe (Inatura, Dornbirn) the campaign was brought out, through paleontologists from Vienna, the speleologists of Vorarlberg and the financing and permission of the landowners was secured.
The excavation campaign will be described with numerous photographs. First results are going to be presented.
With the discovery of the fossil site in the Gauerblickhöhle there is a new high alpine bear cave known, that lies nowadays in a plantless environment and is partially filled with ice.
If the geological age between 50,000 and 60,000 years can be confirmed, we are going to have a remarkable evidence of the mild climate also for the country of Vorarlberg in the so called “Middle Wurmian” period.

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The problem of Ursus deningeroides from Azé 1 and Herkova jama

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Problem:
The relatively small and primeval bear remains from the Repolust cave of the mountain area near Graz (Styria, Austria) were described by Maria MOTTL (1964) as „*Ursus spelaeus deningeroides* n.ssp.“ assuming that the cave bears existed in the same geological epoch as the big and plump cave bears from the “Drachen”-cave of Mixnitz. Revisions by TEMMEL 1996 and DÖPPES & RABEDER 1997 position the bear remains to *Ursus deningeri* because they recognized that the low evolutionary level and the accompanying fauna (e.g. *Canis mosbachensis, Equus* cf. *Mosbachensis)* speak for a middle Pleistocene age for the main fauna of the Repolust cave.
In a small Slovenian cave named Herkova jama close to Radlje ob Drava several remains of a small sized cave bear were recovered in the years 1977-1979 and 2001-2005 (POHAR 1981, POHAR & al. 2003). This bears conform the remains of the Repolust cave so much in the dimension and in the evolutionary level that it must be thought about the same taxonomical position. Therefor both Ursid-populations provisionally are assigned to the species “*Ursus deningeroides*“
The very small dimensions of *Ursus deningeroides* in comparison to the classical Deninger-bear from Mosbach and Hundsheim are inscrutable. A reduction of the dimensions by high alpine cave bears can be interpreted as an adaption to the life in the high mountain ranges (RABEDER & al. 2008) but the Herkova jama and the Repolust cave are situated at a relatively low altitude of about 520 meters.
Ursus deningeroides can be considered to be a branch of the deningeri-group that ended in the middle Pleistocene or an antecedent of one of the late Pleistocene cave bear species such as *U. s. eremus* or *U. ladinicus.*
Beside the attempt to clarify this question by using ancient DNA (in process) comparisons with other middle Pleistocene cave bear populations should be made to clarify the path of evolution.

Comparison with Azé 1:
For comparison the cave bear remains of Azé 1-3 and Azé 1-2 are of special interest:

1. Because of the low dimensions and the primeval characters the remains were associated to *Ursus deningeroides* by A. ARGANT (1991).
2. According to the U/Th dating of the sinter formation that sealed the passage towards Azé 1-3, the fauna could pass certainly from 190 000 (and maybe before) to at most 160 000 years, but not later. (Argant & al. 2007, BARRIQUAND & al. 2011).
3 In the fauna of Azé 1-2 and 1-6 DNA of *Ursus spelaeus ladinicus* has been determined (haplogroup A, ORLANDO & al. 2002).

The aim of the study was to make metrical and morphological comparisons to ascertain if the faunas of Azé 1 differentiate among themselves and between the typical *U. deningeroides* faunas of the Repolust cave and the Herkova jama.

First Results:

- The teeth, metapodials and phalanges of Azé 1-3 are obviously bigger (about 4-5%) than those of the Herkova jama and the Repolust cave.
- The evolutionary level of the 4th premolars is on a much lower niveau in Azé 1-3 than it is at the typical *deningeroides*-faunas.

- The metrical and morphological values of the geologically youngest association of Azé 1-2 are obviously higher than those of the older fauna of Azé 1-3. The number of evaluable premolars however is very low (5 P4 sup., and 7 p4 inf.)
- Azé 1-2 approximates the most primeval type of *Ursus spelaeus ladinicus* (Ajdovska jama s. PACHER & al. 2011).

Discussion:
The cave bear remains of both associations of Azé 1 metrically and morphologically belong to the *Ursus deningeri*-lineage. The relation between the older fauna of Azé 1-3 and the typically faunas of *U. deningeri* and *U. deningeroides* will be discussed just as the possibility that in the fauna of Azé 1-2 there is an overlay of the older U. *deningeri* populations by *Ursus spelaeus ladinicus.*

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Cave and brown bear behaviour inside caves: Ethological and paleontological observations with archaeological implications

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How did bears behave inside caves during the Pleistocene? This key question is important for us as it has profound archaeological implications as our research has proved.
The name ‘cave bear’ was given due to thousands of bone remains of Ursus spelaeus that were found in many caves all over Eurasia. In the beginning of cave bear research these remains were thought to be the result of human respectively Neanderthal hunting. In the meanwhile it was understood that these remains were the result of the hibernation strategy of cave bears, who died from starvation and whose bones accumulated over thousands of years.
Cave and Brown bears behaviour inside caves is not a well-known issue in Archaeology although ursids occupied intensively those caves where also humans developed their activities in the past. Hominids and large carnivores, including bears, used the same caves alternatively and therefore developed an interesting form of interaction while sharing the caves. In this sense, understanding bear cave-related behaviour is something important for Archaeology because we can point them as taphonomic agents contributing to the formation of archaeological assemblages.
With the goal of understanding cave-related bear behaviour, we have developed several taphonomic experiments. The behaviour observed in our ethological surveys can help us reading the archaeological record. Experiments in a wild life park have yielded the basis for a better understanding of bear modifications of the archaeological record and the difference of their behaviour to other large carnivores, such as hyenas, wolves or lions. While hyenas have been the largest bone destroyer during the Pleistocene, the impact of bears on occupational human floors is not very well known. Here we present results of an actualistic study, conducted in a wild life park of Cantabria. Our observations suggest that ursids (at least brown bears) might have been the species that contributed the most to the destruction of human occupation floors in archaeological sites.
On the other hand, the study of archaeo-paleontological contexts has helped us to understand how bears used caves (especially during winter) and how important this issue is for Archaeology. In the present contribution we focus on the site of La Garma (Cantabria, Spain) that has the particularity that the original palaeolithic floor has no sedimentation because the entrance collapsed during the Magdalenian period. In this cave we studied how bears organized their “beds” for hibernation and what was the spatial occupation pattern used by them. The objective is to infer “fossilized behaviour” that can affect the archaeological interpretation of the cave. In this sense, we have observed that bears can “build” circular structures with associated stones that can be interpreted wrongly as

anthropogenic structures. Our observations also show that humans and bears had a clearly different pattern in using caves.
We will also compare hibernation behaviour between brown and cave bears. Some cave bear beds are known so far from Chauvet and Rouffignac.
In summary, in our contribution we analyzed cave-related bear behaviour in order to understand taphonomic influences to the archaeological record that might contribute to misinterpretation of human behaviour.

Figure 1. Bear “beds” and rock art of La Garma (Lower Gallery). Evidence of alternate use of the caves by ursids and humans for different purposes.

Poster - Presentation Sunday, October 6th, 9:00am

Complete Skeleton of Pleistocene Brown Bear (*Ursus arctos*) from Atlantyda Cave (Western Ukraine)

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A complete skeleton of a brown bear (*Ursus arctos* L.) was discovered in the Atlantyda Cave, situated on the right bank of the Zbruch River (left tributary of the Dniester River), near Zavallja Village. The cave, with total length up to 2400 m, is of a maze type and has three levels. It is developed in Miocene gypsum strata. The found skeleton lay along the narrow gallery on the lower level, head to the ancient entrance. It was bedded on the surface of ancient dense loam, covered with the crust of gypsum crystals, iron and manganese hydroxide, and dated to Matujama. The bones were covered with loose fluvial thin-layered loam sediments 25-40 cm thick, including also remains of Chiroptera, Rodents, Lagomorphs and Molluscs, and impure with charcoal fragments up to 4-5 cm in diameter. The occipital part of the cranium was accidently partly destroyed by cavers, who discovered the skeleton, and few bones were partly removed by flowing water from the initial position. The remains belong to old male individual with strongly worn teeth. In size it is small and close to the Early Holocene brown bear from the Bukovynka Cave (Ridush et al., 2012). But the marble-like colour and hygroscopicity of bones most likely indicates their Pleistocene age. More precise dating will be get after detailed research. It is the first finding of complete skeleton of Pleistocene brown bear in Ukraine.

Fig. 1. Brown bear (*Ursus arctos*) skeleton in anatomical position in the Atlantyda Cave.

The cave bears of „Drachenhöhle“ (Dragon cave) of Mixnitz (Styria, Austria) First results of a revision of original material of Abel & Kyrle 1931

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The “Drachenhöhle” of Mixnitz is the biggest cave bear cave of the Alps. It situated in the mountain area near Graz and. The parts that were “inhabited“ by cave bears are more than 500 meters long and widen out up to 40 metres with a height of 10-15 meters. The up to 8 meters thick fossil-bearing layers that were mined in the years 1918-1923 were used for gaining phosphate fertilizer. Within this activities attendant geologists and palaeontologists collected only „wissenschaftlich wertvollen paläontologischen Fundstücke, die einer sofortigen wissenschaftlichen Bearbeitung zugeführt wurden und das Belegmaterial dafür bilden.....“
(scientifically useful palaeontological findings that were immediately conveyed to a scientifically research…) out of the material. This samples were mainly pathologically altered bones and mandibles of cave bears as well as remains of the accompanying fauna (*Panthera, Canis lupus, Capra ibex, Marmota marmota* etc.). Two places were excavated scientifically and the remains were recovered stratified. One excavation site was in a niche called „Abelgang“ (Abel passage) which is situated in the northern wall. The other site is at the base of the second cave-in and was named several times differently: “prehistoric layers“, “palaeolithic fireplace“, “hunting station” but also ”Neanderthaler layers“.

Only those remains of cave bears that are stored in the Institute of Palaeontology of the University of Vienna are considered in this revision. The assemblage of fossils can be distinguished between “Abelgang (Abel passage)“, “Jagdstation (hunting station)“ and “Verlademateriał (loading material)“.
Primarily the cranii, the mandibles, the teeth but also the elements of the extremities were revised.

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A bear braincast from the Neanderthal travertine site of Gánovce (eastern Slovakia).

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A ursid braincast from the Neanderthal site of Gánovce in eastern Slovakia (P-1350), housed in the Podtatranské Museum in Poprad, is represented only by a detailed model of (lost?) original found probably during the travertine exploitation in 19th/20th Century and maybe situated in Prague at present(?).
Based on the preserved and identified characters, the braincast model shows similarities with the ursid braincast from Ramesch Cave (*Ursus spelaeus eremus*) as well as with the one from Deutsch-Altenburg (*Ursus sussenbornensis*), although it is more close in morphology to *spelaeus* form. Its preliminary assignation to *U*. ex gr. *spelaeus* is supported also by a fossil record of cave bear right mandibular fragment with m1-m3 at the site.
The research continues in quest to find the original of the endocast for the more exact morphometric analysis.

Basic measurements: Neopallium length = 107 mm; Braincast (Neopallium) caudal width = 102 mm (= Braincast total width); Braincast rostral width = 52.5 mm; Braincast (Neopallium) caudal height = 88 mm; Braincast rostral height = 41.5 mm; Braincast length (apart of *bulbus olfactorius* and *medulla oblongata*) = 132 mm; Width of *medulla oblongata* = 40.3 mm; Height of *medulla oblongata* = 30.7 mm; Braincast total length = 151,4 mm.

Acknowledgements. The research was carried out with financial support from the Ministry of Education of the Slovak Republic under contact Vega 1/0396/12.

Preliminary isotopic analysis results from the Neanderthal site of the Prepoštská Cave (western Slovakia).

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The Prepoštská Cave (242 m a.s.l.), situated close to Bojnice Castle near Prievidza town in western Slovakia, is known as a Neanderthal site (Bojnice I) since its discovery in 1926. The cave represents an abri with approximately 8m deep space within a travertine heap. Archaeological researches demonstrated one of the most important Neanderthal settlements of the Mousterian Culture in the Slovak territory. On the other hand, fossil record from the site has so far been not studied in detail and therefore it is a subject of a new revisory research at present focused on the taxonomic, taphonomic, radiometric, and isotopic analysis.

Fossils under study were found in the Mousterian layer within former pit III, preliminary dated to the Middle Weichselian (> 40,000 uncal BP). So far, fossil assemblage consists of amphibians (Anura indet.), birds (*Anas platyrhynchos*, *Bucephala clangula*, *Lagopus lagopus*, *Lyrurus tetrix*, *Asio flammeus*, *Asio* cf. *otus*, Falconiformes indet., Aves indet.), and mammals (*Lepus* sp., cf. *Ochotona* sp., *Arvicola terrestris*, *Microtus* cf. *agrestis-arvalis*, Rodentia indet., *Canis lupus*, *C.* cf. *lupus-latrans*, *Vulpes* sp., *V.* cf. *lagopus*, *Ursus* sp., *U.* ex gr. *spelaeus*, cf. *Gulo gulo*, *Martes* sp., Mustelidae indet., *Crocuta crocuta spelaea*, *Panthera spelaea*, *Coelodonta antiquitatis*, *Equus ferus* cf. *germanicus*, *Rangifer tarandus*, cf. *Megaloceros giganteus*, Cervidae indet., *Bos primigenius – Bison priscus*, Bovidae indet., *Mammuthus primigenius*), representing an open to forest-steppe environment with the presence of water source (travertine lake or spring) in the site vicinity. At the time of absence of Neanderthal men at the site, the cave served as a hyena den.

For the first isotopic analysis, remains (bone and tooth fragments) of horse, rhinoceros, wolf, hyena, hare, and fox have been used. Although collagen loss was variable (from 50% to 90% loss of original collagen), all 6 samples yielded well-preserved remaining collagen that still reflects biogenic isotopic composition (based on collagen %C, %N and C/N). Ungulates (horse, rhinoceros) and hare yielded values typical for these species in the "mammoth-steppe" context (horse: $\delta^{13}C$ = -21.6 ‰; $\delta^{15}N$ = 5.8 ‰; rhinoceros: $\delta^{13}C$ = -20.8 ‰; $\delta^{15}N$ = 5.5 ‰; hare: $\delta^{13}C$ = -20.1 ‰; $\delta^{15}N$ = 5.0 ‰). Hyena isotopic values were also typical for a predator ($\delta^{13}C$ = -18.8 ‰; $\delta^{15}N$ = 11.6 ‰). The canids (wolf, fox) exhibit relatively low $\delta^{15}N$ values (6.7 ‰ for the wolf, 7.4 ‰ for the fox) what could indicate partial omnivory or consumption of small prey (rodents, hare). Regarding the low $\delta^{15}N$ values of the wolf, there is another possible explanation than omnivory. It is the fact that $\delta^{15}N$ values tend to decrease with altitude, and carnivores living at high altitude tend to have similar $\delta^{15}N$ values like herbivores living in lowlands. Isotopic data on a wolf from the Bärenloch Cave in Switzerland (altitude 1,645 m a.s.l.) show very similar values ($\delta^{13}C$ = -19.0 ‰; $\delta^{15}N$ = 6.9 ‰). Also in the Gamssulzen Cave, a value of $\delta^{15}N$ for the cave lion is 5.6 ‰. So it is quite plausible that the wolf was living at higher altitude (close mountain areas with the altitude > 1,000 m) while the hyena was dwelling in a lowland area. This assumption is consistent with the absence of hyena in high altitude caves while wolves are found regularly in such sites. On the other

hand, the more recent observation of the arctic wolves from Canada indicates that these feed predominantly on rodents and small mammals during the summer.

Acknowledgements. The research was carried out with financial support from the Ministry of Education of the Slovak Republic under contact Vega 1/0396/12. The gratitude of authors goes also to RNDr. Ján Obuch for the help with bird fossils determination.

EXCURSIONS

Saturday, October 5th 2013:

Excursion Drachenhöhle/Mixnitz or Lurgrotte/Peggau

1. **Drachenhöhle/Mixnitz:** 1,5 - 2 hours walk to the cave entrance, 500m altitude difference, mountainous terrain, physical fitness and appropiate equipment are necessary: **hiking shoes, rain shield, warm clothing, backpack, headlamp (optional)**
   Lunch: Picknick at the cave entrance, packed lunch will be provided

   08:00 Departure from Hotel Semriacherhof– Arrival Mixnitz village ca 8:45, parking place „Drachenhöhle“

   14:00 Departure from parking place to Repolusthöhle ca 30 min

2. **Lurgrotte/Peggau and Josephinengrotte**: Parking place at the cave entrance, Individual lunch at Restaurant Salomon.

   09:00 Departure from Hotel Semriacherhof to Peggau

   14:00 Departure from Peggau to Repolusthöhle ca 30 min

3. **14:30 For both groups:** Repolusthöhle: ca 30 min walk on a forest road

   16:30 Departure from Badl village to Hotel Semriach

4. **18:45** Departure to Lurgrotte Semriach – Evening event with dinner at and in the cave (**we recommend warm clothing!**)

Sunday, October 6th:

- **9:00** Poster presentation at the Hotel
- **10:30** Departure to Frauenhöhle and Leopoldinenhöhle
-
- **13:00** Lunch at Restaurant Sandwirt/Semriach
- **14:30** Hiking tour through Kesselfallklamm to Felsentor (1 ½ hours walk)
- **17:00** Departure to Hotel


19th International
Cave Bear Symposium
Semriach (Styria, Austria)

“Drachenhöhle” Mixnitz

Gernot Rabeder & Nadja Kavcik

Basic data:
Geographic position: 15 ° 22 ' East, 47 ° 19' North, altitude of entrance: 949m
mountain group: Grazer Bergland, bedrock: Hochlantsch limestone (Upper Devonian),
number of Austrian cave cadastre: 2839/1

The "Drachenhöhle" (Dragons Cave) of Mixnitz is the largest cave bear cave of the Alps. The passage once used by the cave bear is about 500 meters long, 40 m wide and 20 m high. Three rock falls divide this almost horizontal corridor into three parts: "Vorhalle" (Entrance Hall), "Mittelhalle" (Central Hall) and "Großer Dom" (Great Dome). These rock falls happened after the cave-bear period.
The cave was well-known by experts by the monograph "Die Drachenhöhle von Mixnitz" by Abel & Othenio Georg Kyrle 1931. In this two-volume publication, many new aspects of cave-paleobiology (such as pathology, functional morphology, taphonomy, endocranial - morphology ...) were extensively discussed for the first time. The fossils described in this paper were discovered during extraction of cave sediments - the up to 8 meters thick fossil-bearing layers that were mined in the years 1918 to 1923 were used for gaining phosphate fertilizer.
Today there is almost nothing to see from the former fossil richness because the cave was searched through by numerous "private excavators".
You can walk up to the 3rd rockfall without special equipment. Impressive are mainly the huge dimensions of the halls and corridors. Special finding areas such as the "Abel passage" or the former excavation area and the “Prehistoric layers" are still visible, even "Bärenschliffe" and "scratches" can be visited.

Fossil fauna from the cave bear layers:

LARGE MAMMALS. *Ursus ingressus* (dominant), *Ursus arctos*, *Canis lupus*, *Vulpes vulpes*, *Gulo gulo*, *Martes martes*, *Panthera leo spealea*, *Capreolus capreolus*, *Bison* sp, *Rupicapra rupicapra*, *Capra ibex*.
An ongoing revision has revealed that all of the cave bear remains from this cave belong to *Ursus ingressus* Rabeder & al. 2004 (see poster presentation, Liedl & al. This volume).

MICROMAMMALS: of particular interest are new taxa of bats that were described by Wettstein-Westersheim (1923): *Myotis "mixnitzensis"* , *Plecotus abeli* and *Barbastella schadleri*. While the taxonomic position of M. mixnitzensis is doubtful because the type material consists only of a mandible-fragment, the originality of *Plecotus* and the *Barbastella*-type is confirmed (Rabeder 1973).
In Drachenhöhle was discovered the first time that marmots (Marmota marmota), who now live in the Alps just above the timberline, have used the cave for hibernation. During the excavations of the cave bear layers many marmot-dens were found, which probably originate from the Würm glacial maximum (about 24-15ka), as the ground outside the cave was partially frozen.

Chronology:

The Pleistocene fauna of Drachenhöhle was originally assigned to the Riss/Würm interglacial stage (130-120kA) (Abel & Kyrle, 1931). The basal bone breccia of the Abel passage was even put into the Middle Pleistocene because of a skull, which is supposedly attributable to

the deningeri-group. A re-examination has shown that this skull is a normal female skull of *Ursus ingressus* (Liedl & al. This volume).
The data from the area of excavation site "Jagdstation" (hunting station - also called "prehistoric layers", "palaeolithic fireplace", "Neanderthal layers") show an age that corresponds to the Middle Wurmian ("Cave bear period").

Table 1. radiocarbon datings of fossils from Drachenhöhle/Mixnitz

locality	layer	material	Lab. Nr.	Date yr	error +	error -	calpal cal. BP	error + / -
Mixnitz	hunting station	charcoal	ETH-10404	25040	270	270	**29961**	329
Mixnitz	hunting station	cave bear tooth	VERA-2543	39420	1070	940	**43467**	829

Archeology

The majority of approximately 800 stone "artifacts" from the "hunting station" are atypical. Six stone tools of horn-stone and jasper as far as two fragments of bone points are typical for Aurignacian.

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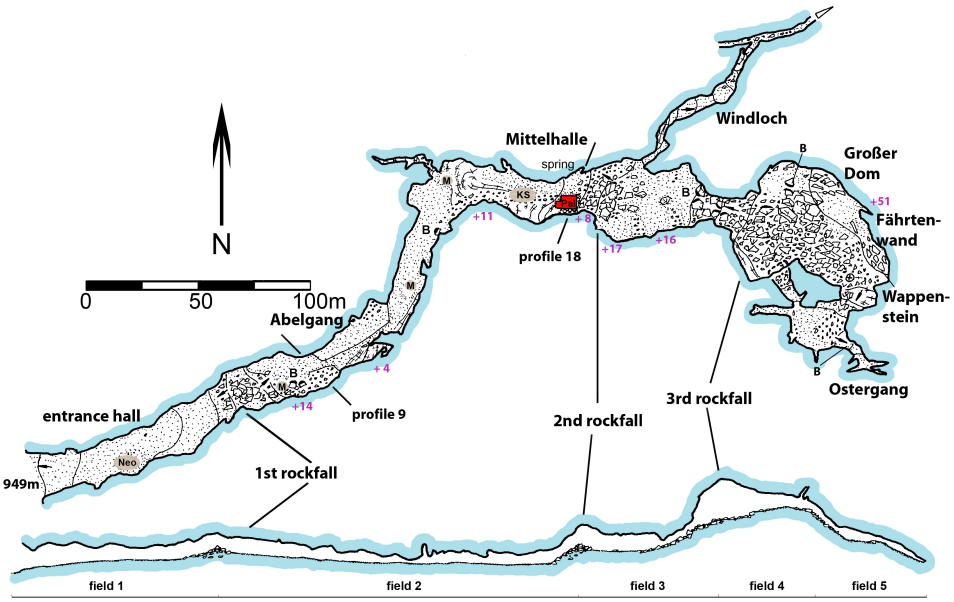


Fig. 1. Groundplan and longitudinal section of Drachenhöhle von Mixnitz (Abel & Kyrle 1931)

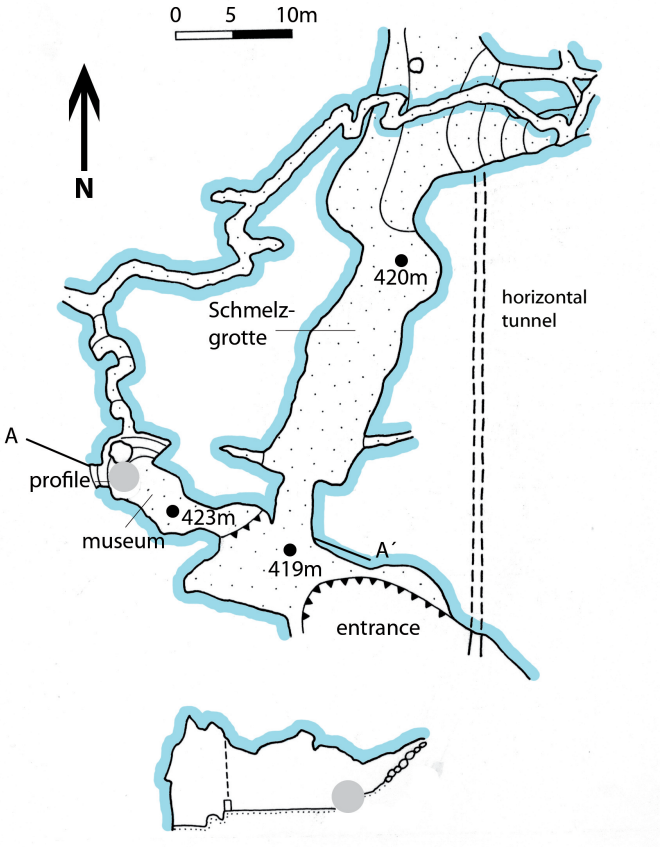
Lurgrotte

Nadja Kavcik & Gernot Rabeder

Basic data:
Geographic position: 15 ° 20 'East, 47 ° 13' North altitude of entrances: 419 and 640m mountain group: Grazer Bergland, bedrock: Schockel limestone (Middle Devonian), number of Austrian cave cadastre: 2836/1a, b

The Lurgrotte is an active water cave. The Lurbach flows from the higher entrance of the cave in Semriach (640m) to its exit in Peggau (419m). In both places, the cave is opened to tourism. At high tide the Lurbach floods most parts of the cave and transports sediments.
In Peggau is a small museum directly in the cave.
In the Semriacher part as well as in exit area in Peggau fossil mammal remains were found, assigned on the one hand to the Middle-Wurmian, on the other hand to the Late Glacial. The cave was not only used by cave bears for hibernation but was also a retreat for cave hyenas, who brought bone remains from large mammals into the cave.
Large mammals: *Ursus spelaeus*-group (presumably *U. ingressus)*, *Canis lupus*, *Vulpes vulpes*, *Martes martes*, *Panthera leo spealea*, *Crocuta spelaea, Bison* priscus, *Rangifer tarandus*, *Capra ibex, Mammuthus primigenius*.

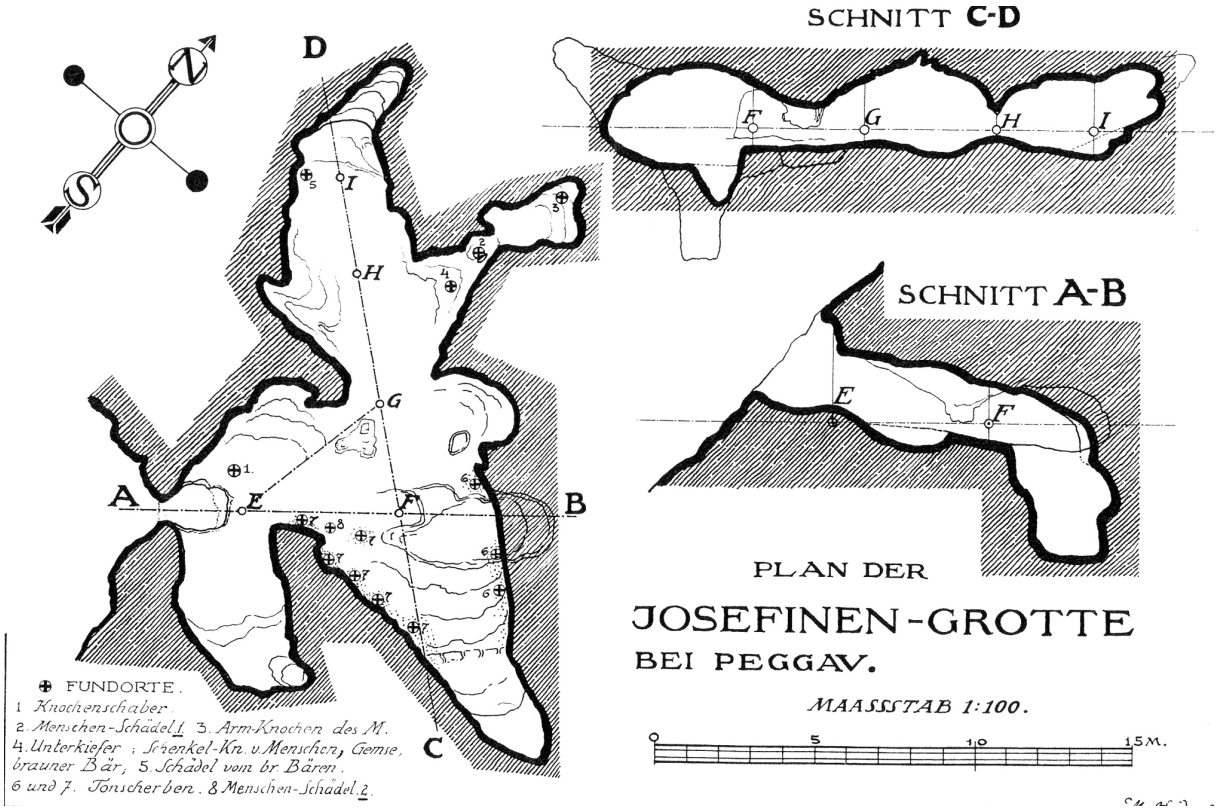
Archaeology: atypical quartzite flakes were interpreted as artifacts, but are listed as missing.



Josephinenhöhle (Cat. 2836/32)

Heinz Kusch

The entrance to this rather small but historically very significant cave is located about 80 m south of the Mur valley above the entrance of the Lurgrotte Peggau in the western slope of Tannebenstock. The cave was rediscovered in 1909 by the speleologists Dirnbacher and Mayer. The approximately 35 m long cave consists of a 10 x 22 m big room with two short transitional parts. Excavations from Hilbers in 1909 showed that the cave sediments in this area are about 8.5 m high. This cave is one of the most interesting cave sites in the Murtal. During the excavation human remains of a 1.51 m tall and 35 to 45 years old woman (from a Neolithic burial) were found, as well as pottery fragments, two bone artifacts and remains of grapevine snails. Some bones of recent species were also among the findings, such as Capreolus, Bos, Ovis and domestic cat. Furthermore, bone material from brown bear (Ursus arctos L.), chamois (Rupicapra Rupicapra L.) and marmot (Marmota marmota L.) was recovered in 1909 (Hilbert).



Repolusthöhle

Gernot Rabeder

Basic data:
Geographic position: 15 ° 20 ' East , 47 ° 18' North altitude of entrance : 525m
mountain group: Grazer Bergland, bedrock : Schockel limestone (Devonian) ,
number of Austrian cave cadastre : 2837/1

This small cave (length about 66m) which was discovered by a miner called " Repolust " in 1910 is in particular important because of its geological age, faunal remains and artifacts. The horizontal passage and the small chamber is nowadays fully excavated and is the Type locality of Ursus deningeroides Mottl , 1964.
The artifacts of Repolust are the oldest traces of humans by far in Styria.

Sediment and fossil vertebrates
Four fossil - bearing strata can be distinguished , which are partially disturbed by fluvial movements but also by bioturbation - especially of *Marmota* , *Vulpes* and *Meles* (Döppes & Rabeder 1997, Brandl & al 2011.).
1. grayish brown layer with rearranged fossils from the second layer
2. "Upper cultural layer " consisting of gray sand which contains allochthonous upper pleistocene - but also even older - vertebrate remains, originating from deeper layers. From the climatic characteristics and the evolution level some of the fossils originates from three different ages. From the late Glacial cold time are *Marmota, Lagopus, Microspalax, Ochotona* and *Capra ibex* (dominant), from the Middle wurmian remains from the *Ursus spelaeus* group as well as cave lions, wolves, foxes and brown bears. Additional you can find relocated fossils from the underlying phosphatic soil from the Middle Pleistocene.
3. The middle layer ("lower cultural layer ") consisting of a predominantly indigenous sediment (auburn phosphate) with a characteristic color and contains remains of Middle Pleistocene mammals: primitive cave bears (*Ursus deningeroides*), Middle Pleistocene wolves (*Canis mosbachensis*), red wolves (*Cuon alpinus*), lions (*Panthera leo fossilis*), leopards (*Panthera pardus*), horses (*Equus mosbachensis*) and bison (*Bison* cf *schoetensacki*), but also Middle Pleistocene micromammals: *Arvicola mosbachensis / terrestris* and porcupines (*Hystrix vinogradovi*) .
4. The chamber and scours (Kolk) at the ground level ate filled with " dark brown phosphatic clay " which contains similar faunal elements as the phosphatic soil above but also *Gulo* sp. , *Crocuta crocuta* and *Allocricetus bursae* .

Table 1.The most important taxa of vertebrates from Repolust cave

Late Glacial	Middle Wurmian	Late Middle Pleistocene
Lagopus mutus	*Ursus spelaeus* group	*Ursus deningeroides*
Marmota marmota	*Panthera spelaea*	*Panthera leo fossilis*
Microspalax leucodon	*Bison priscus*	*Panthera pardus*
Ochotona pusilla		*Equus* cf. *mosbachensis s*
Rangifer tarandus		*Canis mosbachensis*
Capra ibex		*Crocuta crocuta*
		Gulo cf. *schlosseri*
		Bison cf. schoetensacki
		Hystrix cf. vinogradovi

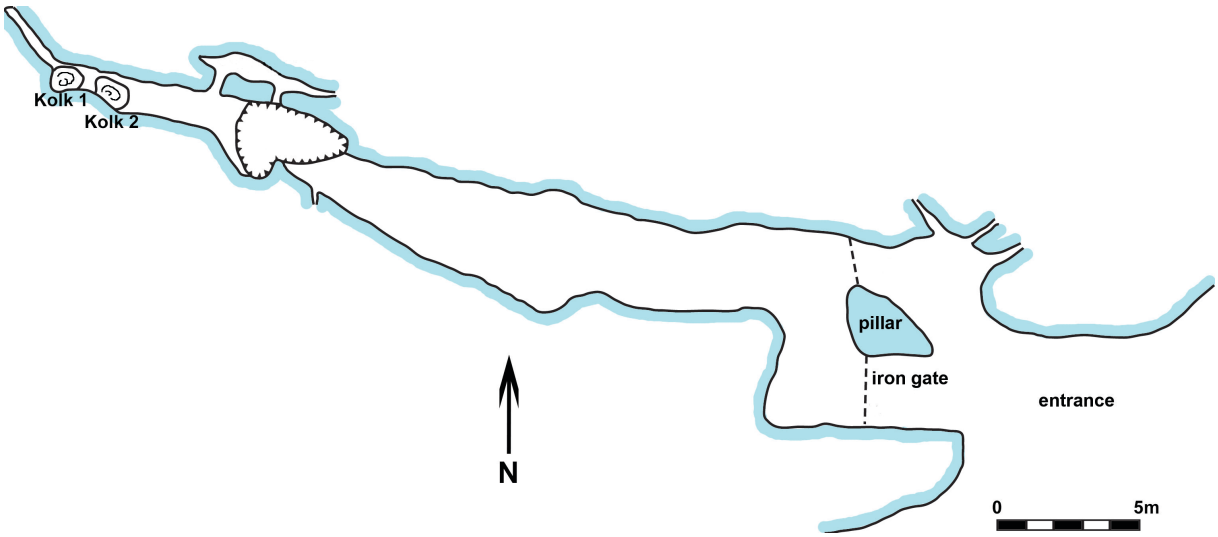
Archaeology
Cultural remains were recovered from the Holocene layers, ranging from the Neolithic to modern times. In the upper cultural layer Hornstein tools were found, which are attributed to the Aurignacian.
In the lower cultural layer over 2000 artifacts from chert, quartzite and bones were discovered. The very primitive technique that has been used in the manufacture of the most one-sided hewed tools, are comparable with techniques of the Lower Palaeolithic (Clactonian).
Recent studies have shown that the material of chert tools is tabular chert, corresponds to the Reiner was mined in the basin near Graz (Brandl & al 2011.)

Chronology
No radiocarbon datings
Following U / Th data are controversial because their values do not match the stratigraphy . " Open systems "for the uranium has been suggested. But considering the rearrangements that are observed among vertebrate remains, the data from the chambert does not appear irregular.

Table 2 radiometric dates of bones from the cave Repolust (Styria, Austria)

laboratory	lab.-nr.	taxon	material	method	age	1 sigma +	1 sigma -	corrected	±	layer
Hannover*	Uh 1267	*Ursus* sp.	ulna	U/Th	**41.400**	1700	1700	41.400	1.700	grey sand layer
Hannover*	Uh 1265	*Ursus* sp.	bone	U/Th	**50.100**	2100	2100			Shaft 1,5-2,5m
Hannover*	Uh 1266	*Ursus* sp.	astragalus	U/Th	**93.200**	2800	2800	85 800	2.800	auburn phosphat
Hannover*	Uh 1268	*Ursus* sp.	bone	U/Th	**223.600**	13400	11800			auburn phosphat
Hannover*	Uh 1269	*Ursus* sp.	bone	U/Th	**> 331 000**					Shaft 3,8-4,5m

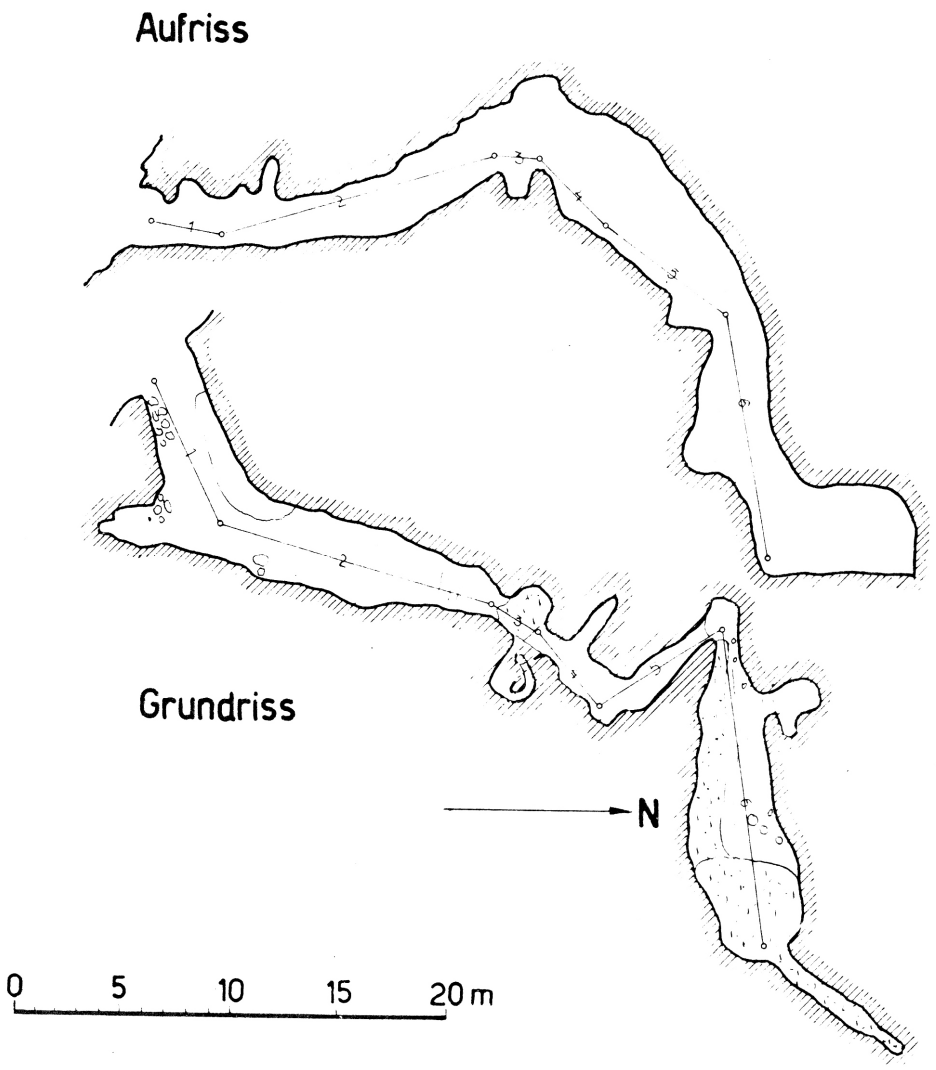
Hannover* = Niedersächsisches Landesamt für Bodenforschung
references: Fuchs & al. 1997, Brandl & al. 2011, Pacher & Stuart 2008



Frauenhöhle (Cat. No 2832/15)

Gernot Rabeder

The entrance of the cave is located in a small rock slope in the southwestern part of Karlstein at the Kesselfall near Semriach. The cave is 60 m long and extends 48 m into the bedrock. A 30 m long, meandering corridor leads to a fissure where a 12 m deep vertical shaft is leading into the lower parts of the cave. During excavations in 1947 and 1949 (V. Maurin and M. Mottl) as well as 1911 and 1913 (Drugcevic F. and H. Mayer),numerous bone material was found. Mottl discovered following species in the entrance area: cave bear (*Ursus spelaeus ROSENM*), lion (*Panthera leo* cf *spelaea* goldf), wolf (*Canis lupus* L.), fox (*Vulpes vulpes* L.) and marmot (*Marmota marmota* L.). The fauna in the shaft: cave bear (*Ursus spelaeus* ROSENM.), brown bear (*Ursus arctos* L.), cave lion (*Panthera spelaea* goldf.), ibex (*Capra ibex* L.), wolf (*Canis lupus* L.), fox (*Vulpes vulpes* L .) and marmot (*Marmota marmota* L.). Archaeological findings were indefinite potsherds and a blade of yellow-brown flintstone (Upper Paleolithic). Because of the vertical tunnel in the backmost part, the cave can be described as a typical example of a natural animal trap.

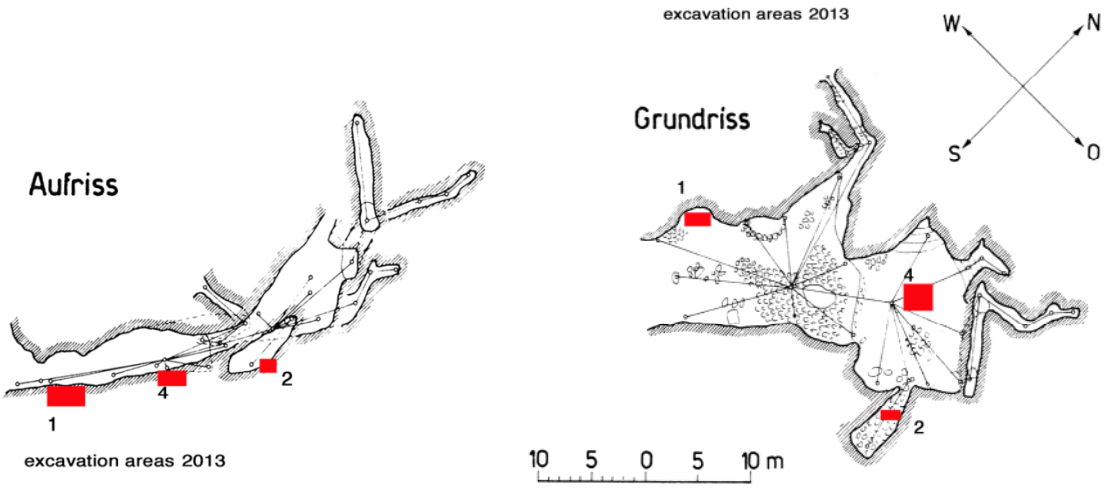


Leopoldinenhöhle

Heinz Kusch & Gernot Rabeder

Basic data: Geographic position: 15 ° East, 47 ° North, altitude of entrance: 600m
length ca. 140m,
mountain group: Grazer Bergland, bedrock: Schöckel limestone (Middle Devonian),
number of Austrian cave cadastre: 2832/11

The entrance of the Leopoldinengrotte, which is around 100m above the valley floor, is situated in the south-west slope of the Karlstein (altitude 762m) close to the Kesselfall by Semriach. Today this cave ranks among the most famous archaeological cave sites in the Grazer mountain region. The archaeological inventory that was periodically recovered since 1892 ranges temporally from the Palaeolithic, Neolithic, Bronze Age and Roman Age to the Middle Age up to present days. A sounding excavation was conducted by the palaeontologist Maria Mottl in the year 1949. At this excavation remains of cave bears (Ursus spelaeus ROSENM.), Alpine ibex (Capra ibex L.) and domestic animals (goat, pig, cattle and horse) were recovered. Within an archaeological excavation in the year 2001 under the direction of the prehistorian Heinrich Kusch bones of domestic animals and pottery of the Neolithic and Copper Age were found. This material proves the presence of humans in this cave since the Neolithic.
Another excavation took place in this year's September under the direction of Heinrich Kusch and Gernot Rabeder. In the excavation site 1 and 4 numerous archaeological finds especially ceramics, Neolithic stone artefacts and jewellery were recovered.
Underneath loams proved to be devoid of finds. In the deeper situated excavation site 2 numerous bones and teeth of cave bears were detected. Due to the high evolutionary level of the teeth those cave bears can be assigned to *Ursus ingressus* Rabeder & al. 2004.



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