

Field trip guide; July 24, 2009; Stop 2:

The Rixdorf Horizon („Rixdorfer Horizont“) of the Niederlehme sand pits near Königs Wusterhausen

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Fossil mammals from the ice age have been found in Berlin and the former Margraviate of Brandenburg since the 18th century and many important finds were reported during the second half of the 19th and the 20th century. In the region, mammal bones are rare in interglacial strata, but frequent in glacial sediments, such as gravel, gravel-sand, and sand deposits. The best example for a glacial mammal deposit is the so called Rixdorf Horizon (“Rixdorfer Horizont”), a glaciofluvial gravel-sand layer, which yields one of the most important Pleistocene mammal assemblages from the northern Middle European lowland. The Rixdorf Horizon is characterised by an accumulation of bones in melt water deposits, typically over- and underlain by glacial drift sediments and exposed at several localities. The classic localities of the Rixdorf Horizon in Berlin (e.g., Rixdorf, Tempelhof) are overbuilt and cannot be accessed. The sand pit Niederlehme near Königs Wusterhausen is still in use today, displays a fully exposed Pleistocene profile, and represents the most important locality of the Rixdorf Horizon. Skeletal remains of Rixdorf mammals are deposited in various museums in the states of Berlin and Brandenburg.

Localities of the Rixdorf Horizon are located in a NW/SE oriented strip within younger moraines dated as part of the Brandenburg Stade within the Weichselian Glacial. The strip is bounded to the south by the border of the Brandenburg maximum ice advance, which marks the maximum extension of the Weichselian inland glaciers, and to the north by the ice margin of the Frankfurt Stade. The locality Niederlehme is positioned on one of several plateau islands in the south of the Berlin glacial valley (Berliner Urstromtal). The area is mostly covered by Weichselian and Holocene sediments, which are underlain by older Pleistocene sediments. The plateau islands are surrounded by valley sands to the north and south, and bounded by gullies of the river system Dahme to the east and west. The Niederlehme plateau island consists of glacial till, gravel sands, sands and silt, and its southern and western part with the locality Niederlehme was interpreted as a dislocated moraine (Keilhack 1921), part of the Weichselian maximum ice advance (Behrmann 1950), or as a glacial kame terrace (Dietrich 1932).

There are two sand pits in Niederlehme, both of which have produced fossil mammals. They are situated about 3 km northeast of the town of Königs Wusterhausen, North (N 52°19'30", E 13°40'45") and South (N 52°18'40", E 13°40'28") of highway A10. The following description of the sequence is based on the profile in the sand pit Niederlehme North of the highway. It has been active since the 1870s and was expanded during the construction boom in Berlin at the end of the 19th century. In the sand pit, an approximately 25 m thick Pleistocene succession of sediments is exposed (Dietrich 1932, Cepek 1986, Heinrich 2002), comprising the following lithostratigraphic units (Fig. 1): The underlying stratum is formed by a dark- to olive brownish Lower Till (“unterer Geschiebemergel”), which reaches a thickness of up to 8 m. This Lower Till was deposited during the Saale glacial (Hermdorf 2000). On top of the Lower Till a strongly lithified layer is often found, the so-called “Steinsohle”, which was formed by glaciofluvial leaching. On top of the Steinsohle 1-2 m of thick Rocky Gravel Sands (“steinige Kiessande”) follow, which are exposed at the quarry floor. The Rocky Gravel Sands form the Rixdorf Horizon in a narrower sense, they are the primary strata that yield mammal remains at Niederlehme, but they also contain re-deposited shells of *Viviparus diluvianus* and clay clasts that have been washed into the strata as frozen particles. Recently, a fluvial channel with fossils and a frost wedge were discovered, indicating a short interruption of the sedimentation under glacial conditions

(Hermsdorf 2000). The Rocky Gravel Sands were deposited during the peak of the Weichselian glacial and are estimated to have an age of 27000 – 30000 years (Hermsdorf 2002). They are overlain by an up to 20 m thick Sequence of Sands (Abfolge von Sanden) which is lithified at its base and mostly consists of fine-grained, partially cross-bedded sand. Mammal remains are extraordinarily rare in the Sequence of Sands. The sands were deposited by running melt water, and the decrease in grain sizes from the base to the top and the northwestern flow direction indicate glaciofluvial de-watering in the retraction phase of the glaciation. The top of the profile is formed by the Upper Till (“oberer Geschiebemergel”), which reaches a thickness of up to 2 m and is followed by a periglacial cover. The Upper Till is interpreted as a ground moraine of the Weichselian Glacial (Brandenburg Stade) and was formed during the main expansion of the Weichselian glaciers about 20000 years ago.

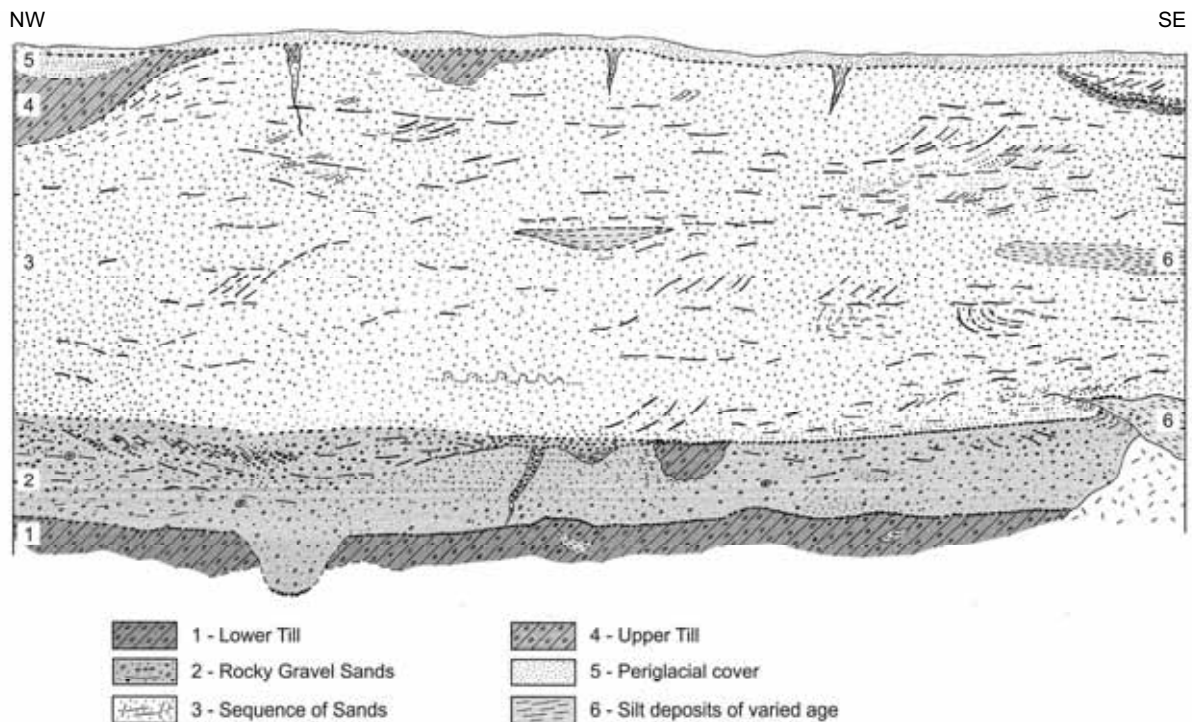


Fig. 1. Geological profile of the northern Niederlehme sand pit. Height of section is about 20 m. Modified from Hermsdorf (2000).

In the Rocky Gravel Sands, mammals are represented exclusively by isolated bones, teeth and antler fragments. The fossils can sometimes be found in cluster-like accumulations. Well-preserved bones and teeth are rare, and most remnants are broken or eroded with abrasion marks. Some long bones (e.g., *Coelodonta antiquitatis*) show bite marks. The bones are mostly of a light- to middle brown colour, showing manganese-dendritic mottling as well as patches of differing brownish colours that were produced by redeposited lignites within gravel sands (“Rixdorf preservation”).

For a long time, the Rixdorf Horizon yielded only big mammals. Tusks and molars of *Mammuthus primigenius* (woolly mammoth) were already reported by Berendt in 1882. Other examples include molars of *Coelodonta antiquitatis* (woolly rhinoceros), jaw remains of *Canis lupus* (grey wolf), and antler remains of *Rangifer tarandus* (reindeer) and *Megaloceros giganteus* (giant deer). Rare, isolated finds are known of the smaller *Castor fiber* (beaver) and *Alopex lagopus* (Arctic fox), and tiny molars of *Lemmus lemmus* (Norwegian lemming) were reported recently as well (Hermsdorf 2000). The most frequent finds include *Equus* sp. cf. *germanicus* (German wild horse), followed by *Mammuthus primigenius*, *Bison priscus* (steppe bison), and *Coelodonta antiquitatis* (Fig. 2). Rarer finds include *Rangifer tarandus* (reindeer), *Megaloceros giganteus* (giant deer) and *Cervus elaphus* (red deer). There may have been a collecting bias in the past, when only the most attractive fossil bits were saved. All in all, the fauna of the Rixdorf Horizon currently lists 26 mammal species.

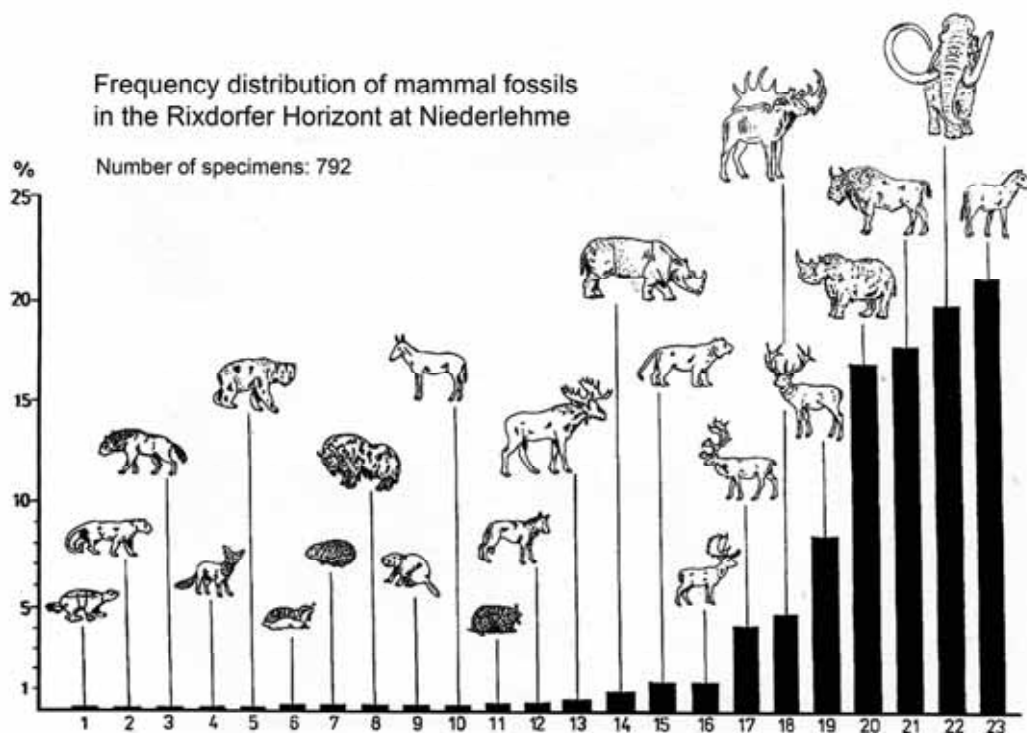


Fig. 2. Frequency distribution of fossil mammals in the Rocky Gravel Sands, Rixdorf Horizon at the Niederlehme sand pits. 1 – wolverine (*Gulo gulo*); 2 – leopard (*Panthera pardus*); 3 – cave hyena (*Crocuta crocuta spelaea*); 4 – Arctic fox (*Alopex lagopus*); 5 – cave bear/brown bear (*Ursus spelaeus/arctos*); 6 – Norwegian lemming (*Lemmus lemmus*); 7 – vole (*Microtus* sp.); 8 – muskox (*Ovibos moschatus*); 9 – European beaver (*Castor fiber*); 10 – wild ass (*Hemionus hemionus*); 11 – collared lemming (*Dicrostonyx* sp.); 12 – gray wolf (*Canis lupus*); 13 – elk (*Alces alces*); 14 – forest rhino (*Stephanorhinus kirchbergensis*); 15 – cave lion (*Panthera leo spelaea*); 16 – fallow deer (*Dama dama*); 17 – reindeer (*Rangifer tarandus*); 18 – giant deer (*Megaloceros giganteus*); 19 – red deer (*Cervus elaphus*); 20 – woolly rhinoceros (*Coelodonta antiquitatis*); 21 – steppe bison (*Bison priscus*); 22 – woolly mammoth (*Mammuthus primigenius*); wild horse (*Equus* sp. cf. *germanicus*). Modified from Heinrich (2002).

The sand pit at Niederlehme represents the richest mammal taxon assemblage from the Rixdorf Horizon, and therefore is considered to be more representative for these strata than other localities. The known fossil mammal taxa are interpreted as primary and secondary allochthonous skeletal remains. The former were re-deposited but are geologically from the same age as the Rixdorf Horizon” itself. The latter are skeletal remains from older strata such as interglacial sediments, which were re-bedded in the Rixdorf Horizon and are not authentic elements of the Rixdorf fauna. These are sometimes deciduous and mixed forest inhabitants, which occurred in middle Europe only during interglacials: *Elephas antiquus* (straight-tusked elephant), *Stephanorhinus kirchbergensis* (forest rhino), and *Dama dama* (fallow deer). By far more frequent are inhabitants of the steppe and tundra, which existed in the area only during glacial times and are represented for example by *Equus hemionus* (Asian wild ass), *Ovibos moschatus* (musk ox), *Rangifer tarandus* (reindeer) and *Alopex lagopus* (arctic fox). Finally there are also mammals that inhabited the area during glacial and interglacial times, such as *Canis lupus* (grey wolf), *Megaloceras giganteus* (giant deer) and *Panthera leo spelaea* (cave lion). The demands of these mammals from their environment are very different, so that they cannot have existed synchronously. Thus, Niederlehme most likely represents a heterochronous faunal mix, similar to all other localities of the Rixdorf Horizon.

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