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A forked bone from Middle Palaeolithic Levels in the Wannen Volcano (Rhineland-Palatinate)

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SUMMARY
The authors describe a distally forked bone found during the excavation of middle palaeolithic levels in the crater of the Wannen volcano (Rhineland-Palatinate, West Germany). Similar finds have often been described as palaeolithic "artefacts", but are now thought to be the result of chewing by animals, probably by ungulates.

SAMENVATTING
De auteurs beschrijven een distaal gevorkt bot dat gevonden is tijdens de opgraving van midden paleolitische lagen in de krater van de Wannen vulkaan (Rheinland-Pfalz, BRD). Soortgelijke vondsten zijn dikwijls beschreven als paleolitische "artefakten". Tegenwoordig worden deze geacht veroorzaakt te zijn door het kauwen door dieren, waarschijnlijk door hoefdieren.

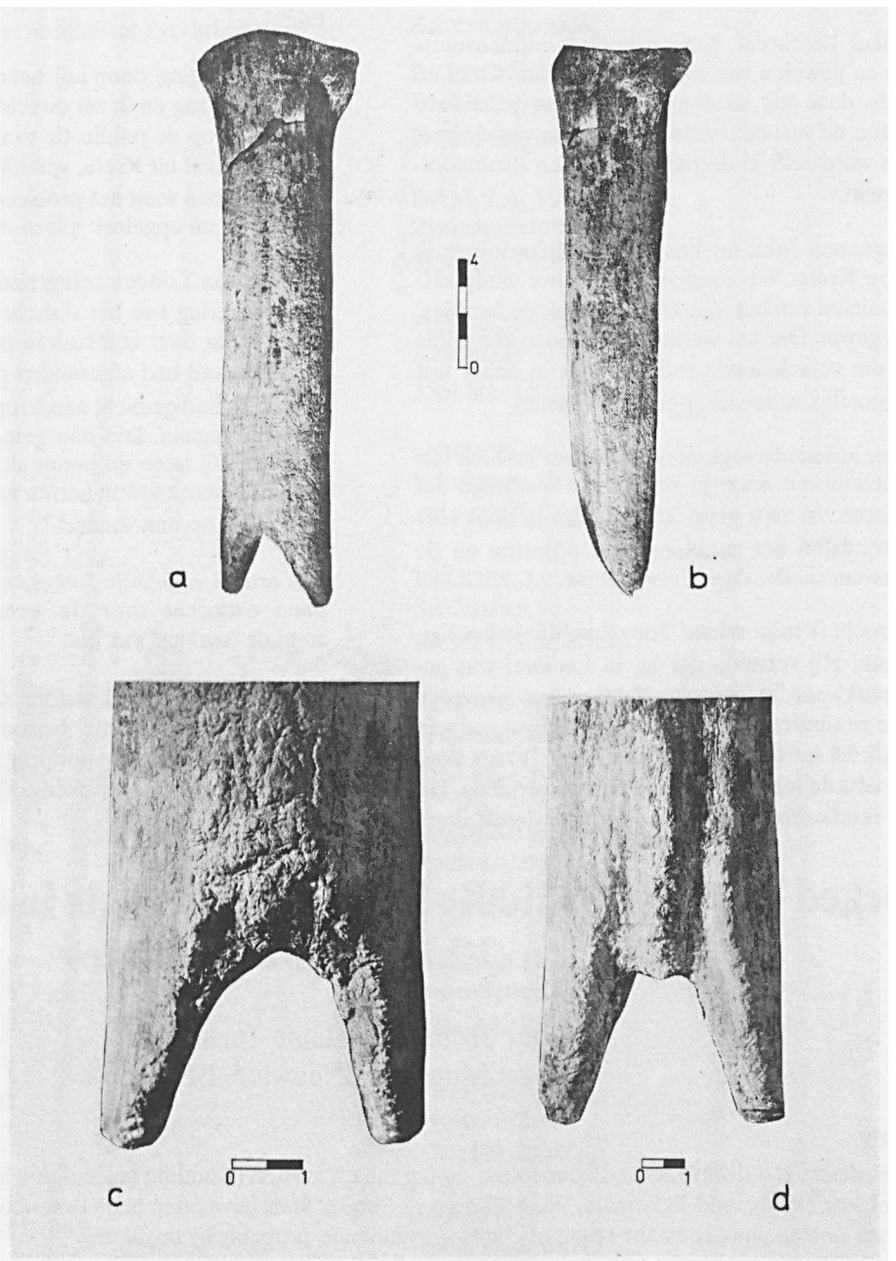

Figure 1. The forked horse metatarsus from the Wannen, a) anterior view, b) lateral view, c) distal end, anterior view, d) distal end, posterior view. Scale in centimeters.

Figuur 1. De gevorkte metatarsus van een paard van de Wannenvulkaan, a) anterieur, b) lateraal, c) distaal eind, anterieur, d) distaal eind, posterieur. Schaal in centimeters

During the Tertiary and Quaternary periods the region to the west of the Central Rhineland, known as the Eifel, was the scene of continuous volcanic activity. In the area around the Laacher Lake, known as the East Eifel, the majority of the extinct volcanoes are basaltic scoria cones with a central crater. After eruption had ceased, the craters of these volcanoes were subsequently filled with sediment, particularly loess deposited during the Pleistocene cold stages.

Re-exposure of these deposits during recent commercial scoria extraction has revealed evidence that man repeatedly occupied the craters of the volcanoes during the Late Middle Pleistocene and Late Pleistocene periods (BOSINSKI *et al*, 1986). The situation on top of the volcanoes, with their sheltered craters and a wide view from the summit, must have been very attractive to early man, and rich archaeological horizons have been investigated at several localities, such as the Plaidter Hummerich, the Tönchesberg, Schweinskopf-Karmelenberg and the Wannen (BOSINSKI, 1986).

The first finds from the Wannen volcano were discovered in 1985 by the hobby archaeologist and collector K.-H. Urmersbach. Excavations in the loess-filled crater of this volcano began in 1986, during the course of which five archaeological horizons, probably dating to the Saale or Penultimate Cold Stage, were identified (JUSTUS *et al.*, 1987; JUSTUS, 1988).

During the summer of 1986, horizon 4 was excavated. The finds from this horizon consisted of a number of stone artefacts and a large amount of faunal remains from species such as wolf *Canis lupus,* badger *Meles meles*, horse *Equus* sp., woolly rhinoceros *Coelodonta antiquitatis*, red deer *Cervus elaphus*, reindeer *Rangifer tarandus*, a large bovid *Bos* sp. or *Bison* sp. and possibly chamois *Rupicapra rupicapra* (TURNER, 1989). In this aspect the finds from horizon 4 were more or less identical with those recovered from the other horizons at the site, in other words a Palaeolithic assemblage associated with the remains of animals hunted by man and indicative of a cold, predominantly open environment. However, the form of one particular bone from this horizon, a metatarsus or foot-bone from horse, attracted the attention of the excavators.

The specimen is a left metatarsus or rear foot bone of a horse (*Equus* sp.) (Registration number: Wa 97/50, :. 56. Fig. 1). The proximal end of the bone is complete, although slightly damaged during excavation; the distal joint is missing. The bone is preserved to a length of 206 mm. A complete metatarsus of horse from the same horizon measured 275 mm. in length, which indicates that not only the distal joint, but also the distal part of the bone-shaft or diaphysis of the specimen from horizon 4 is missing.

The distal end of the shaft has a wide arched opening at its base penetrating the bone to a depth of about 30 mm. on both the anterior and the posterior side and revealing the marrow canal. Two "prongs" of bone have thus been formed, each being placed laterally on the specimen (Fig. 1a). When viewed from the side, the bone appears pointed at the distal end (Fig. 1b). The points of the "prongs" both show signs of recent damage. The edges of the "prongs" are somewhat rounded and the surface of the edge on the anterior face is indented (Fig. 1c). Two shallow grooves running parallel to the long axis of the bone can be seen on the posterior face of the bone. The grooves begin at the proximal end of the arch and continue along the bone for about 20 mm. on the right side and about 28 mm. on the left side (Fig. 1d).

Attempts to investigate the bone surface in more detail with a hand-held lens brought no results, as the specimen had already been surficially modified by the smooth, sinuous U-shaped channels typical of root-etching. Root-etching is caused by the acids in rootlets which attack the surface of the bone as it is being buried (COOK, 1986; SHIPMAN, 1981), and their presence on the features described above indicates that the "forking" of the specimen must have taken place before burial.

The interpretation of modified animal bones, particularly from Pleistocene deposits, has occupied scientists for most of this century. However, it was Raymond Dart's claims in the 1950s for an "osteodontokeratic" culture (for example, DART, 1957) which brought support to the ideas of authors such as BREUIL (1939), who believed that certain patterns of bone breakage and bone modification were the result of human action, and inspired many other publications on the controversial subject of bone "tools".

Authors such as KITCHING (1963), for example, described in great detail the "Osteodontokeratic Outfit of Mousterian Man" (KITCHING, 1963, p. 45) based on his interpretation of bones found in the Pin Hole Cave in Derbyshire, England. Kitching furnished Mousterian Man with a wide range of bone implements from "ripping tools" to "scoops or cups and tankards".

Although Mousterian Man in England did not appear to possess the technology to produce "forked" bones, Palaeolithic man in Crete, according to KUSS (1969), certainly did. Kuss described bones and antlers of pygmy deer *Cervus cretensis* from the island of Crete, which he considered to have been converted into artefacts by Palaeolithic man. Amongst the finds were several "forked" bones including metapodia, and Kuss concluded that "cretean palaeolithic man mostly formed forklike tools" (KUSS, 1969, p.137).

The similarity between bones and antlers gnawed by deer and other ungulates to human "artefacts" and particularly "forked artefacts" was first pointed out by SUTCLIFFE (1973). The abnormal chewing of bone, known as osteophagia, is often a sympton of phosphorus defi-

reindeer, muntjac deer, camels, giraffes, wildebeest, kudu, gemsbok, sable antelopes and nyala antelopes (SUTCLIFFE, 1973; 1977). BROTHWELL (1976) recorded bones apparently chewed by sheep from the island of North Ronaldsay, Orkney. The sheep on this island feed mainly from phosphorus-rich seaweed which, as SUTCLIFFE (1977) points out, suggests that in this case the deficiency that causes osteophagia is of some other substance.

Bones and antler chewed by ungulates often have "forked" ends resulting from the way in which the object is chewed, and it is known that red deer, reindeer, nyala antelope and, apparently, sheep can produce this kind of modification (BROTHWELL; 1976; SUTCLIFFE, 1973; 1977). Deer, cattle, antelopes and sheep do not possess upper incisors and therefore have to use their opposing cheek teeth to chew. In those cases where chewing has actually been observed, the behaviour appears to be constant. The bone or antler is held lengthwise, aslant in the mouth, where a sideways chewing movement of the cheek teeth is applied. The upper and lower part are thus removed until the marrow cavity or antler core is reached, leaving the sides intact to form the prongs of the "fork" (SUTCLIFFE, 1973; 1977).

Sutcliffe describes and figures recent red deer metapodials, chewed by red deer (1977, Fig. 3). In each case the distal "fork" has its prongs placed laterally. The edges of the "prongs" are rounded and occasionally show evidence of pitting on the bone surface. The placing of the "prongs" appears to follow a regular pattern relating to the form of the bone and the way in which ungulates chew them. During chewing, the bones become oriented with their widest diameter across the width of the mouth. As metapodia are flattened antero-posteriorly at the distal end, then the "prongs", being formed on the shortest side of the bone, are always placed laterally.

Brothwell described the loss of bone amongst his specimens as being due to a "grazing-sawing" action (1976, p.182). His illustrations (BROTHWELL, 1976, Fig. 2) also show on the forked end of the bones and extending along the shaft, the same irregular surficial pitting and scoring as recorded on Sutcliffe's specimens. Pitting and scoring also occur on bone and antler chewed by other animals (see, for example, BINFORD, 1981; HAYNES, 1980; MILLER, 1969; SUTCLIFFE, 1970; WETZEL, 1969), but well-developed "forking" and the distinct placing of the distal "prongs" appears to be a particular ungulate trait.

As SUTCLIFFE (1973; 1977) has already stated, the cervid bones and antlers described by KUSS (1969), show exactly the same modifications as those recorded on the recent material, and cannot be considered as an assemblage of human artefacts. Two metatarsals, in particular (KUSS, 1969; Plate III, Figs. 4-5 and Plate IV, Figs. 1-3), have forked distal ends, with all the characteristics associated with ungulate chewing described above.

The Wannen horse metatarsus, with its well-developed distally "forked" end and laterally placed, slightly surficially pitted, "prongs", is identical to the recent and fossil specimens of ungulate chewing described by SUTCLIFFE (1973; 1977) and KUSS (1969), and in this aspect also appears to have been an object of ungulate interest. However, the two grooves on the posterior face towards the distal end of the bone (Fig. 1) do not appear to have parallels amongst the examples illustrated in the literature.

Forked horse bones, similar to the one from the Wannen, have also been described as human artefacts by Lanser (in BOSINSKI (ed.), 1982, Fig. 25). The two horse metapodia were recovered from bore-holes taken prior to renovation work on the Rhine-Herne canal near Essen-Dellwig (Nordrhein Westfalen). Fossils from Essen-Dellwig include the remains of mammoth *Mammuthus primigenius*, woolly rhinoceros *Coelodonta antiquitatis*, red deer *Cervus elaphus* and stone artefacts. They are thought to date to the end of the Last Interglacial (Eemian) or the beginning of the Last or Weichselian Cold Stage (HEINRICH, 1987); a date at the end of the Penultimate or Saalian Cold Stage is also possible (KAHLKE, 1975 & SCHMITZ, 1988).

The specimens from Essen-Dellwig (a metatarsus and a metacarpus) show the typical surficial pitting and scoring resulting from chewing or gnawing by animals rather than modification by man (SCHMITZ, 1988). More important, the distal ends of both bones are "forked" with laterally-placed "prongs", the edges of which are rounded showing surficial pitting and scoring, suggestive of modification by ungulates. The proximal end of the metacarpus shows two parallel shallow grooves placed horizontally to the long axis of the bone, also occurring during chewing by an ungulate.

HEINRICH (1987, Fig. 92) also illustrates a further modified horse bone (?metacarpus) from the Rhine-Herne canal. The specimen has a forked distal end with laterally-placed "prongs" and prominent surficial scoring of the distal part of the shaft. It was correctly described by HEINRICH (1987) as an example of animal chewing of bone, and the modification of the distal end is again suggestive of ungulate chewing.

Thus, four modified horse metapodia recorded from cold stage Pleistocene deposits in West Germany show characteristics indicating that they might have been chewed by ungulates. If this assertion is correct, the question of which species was responsible for the modification arises. At the Wannen, red deer, reindeer or the large bovid may have been the culprits, although whether deer were capable of chewing away the thicker bone walls of horse metapodia or whether a larger ungulate was involved is not clear.

The cause of osteophagia at the Wannen site may have been due to phosphorus deficiency. The Central Rhineland region is phosphorus-poor today and was probably so during the Pleistocene periods (pers. comm. A. Ikinger). Thus, the many bones and antler left behind by man in the crater of the volcano would have been an appetizing prospect for animals requiring phosphorus.

"Forked" horse metapodia are, as far as the authors know, only represented by fossil specimens, and it would be interesting to see if such phenomena are known from regions today where horses live, and presumably die, in the wild or feral state. The authors would also be interested to know of any information on recent or fossil "forked" bone and antler.

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