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DIETRICH MANIA, EMANUEL VLČEK

HOMO ERECTUS FROM BILZINGSLEBEN (GDR) — HIS CULTURE AND HIS ENVIRONMENT

ABSTRACT — The outcome of the excavation and research of the Middle Pleistocene travertin site at Bilzingsleben during the last years is delt with in this paper referring to multidisciplinary work like geology, stratigraphy, morphology and geochronology of the site, its archaeological situation, biology, phylogeny, economy, sociology and ecology of Homo erectus from Bilzingsleben. The site was proved to have been the living-floor of a Homo erectus group containing structures of small dwelling objects, workshops, hearths, tools made of silex showing special functions, crude peble tools, bone and antler tools which had also been differentiated according to their functions, refuse of game bones having been obtained by a partially specialised big game hunting. Besides other examples of anticipated activities there are some other bone tools bearing engravings which must be regarded as deliberate representations, evidence of the highly developed intelligence of the late Homo erectus. His skull remains so far found at Bilzingsleben are described.

All results have been obtained by the collaboration of a team of scientists from numerous disciplines.

KEY WORDS: Homo erectus—Tools—Tool technique—Workshop—Dwelling structures—Hunting economy—Palaeo-ecology—Deliberate engravings.

Central Europe has been enriched by the discovery of a hominid, that is of the remains of a Homo erectus skull found in a Lower Palaeolithic archaeological horizon of a travertin locality excavated on the northern border of the Thuringian basin (*fig. 1*). The site named "Steinrinne" is situated in the Wipper valley near Bilzingsleben. In 1969, during geological investigations, the horizon containing the finds was discovered. Extensive excavations followed carried out by the Landesmuseum für Vorgeschichte Halle.

The abundance of archaeological finds, the favourable geological and palaeontological conditions as well as the extension of the archaeological horizon led to large research campaigns which will go on for the next years to come. Different specialists from the archaeological discipline and from natural sciences presented their results in numerous papers and in three volumes of a monograph describing the site in detail (Bilzingsleben I-III, 1980, 1981, 1986). The present paper is based on these results.

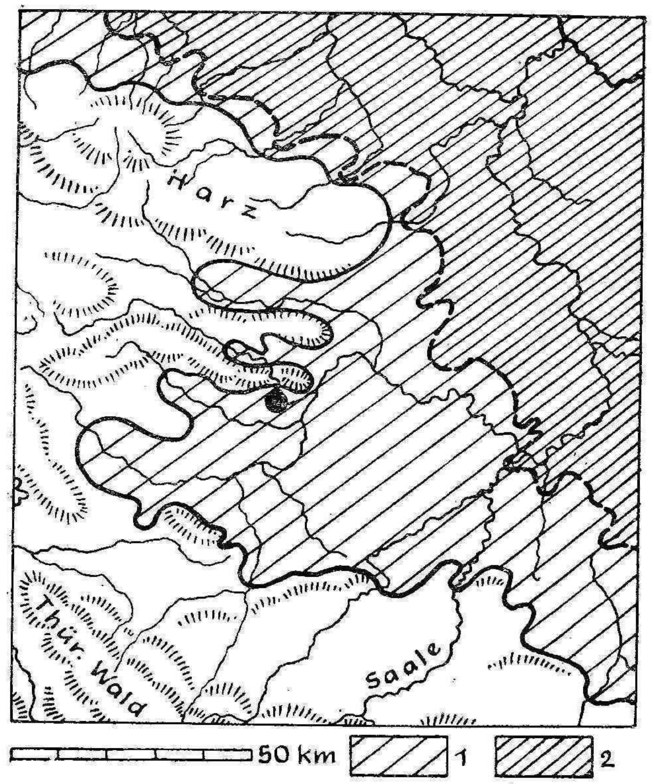
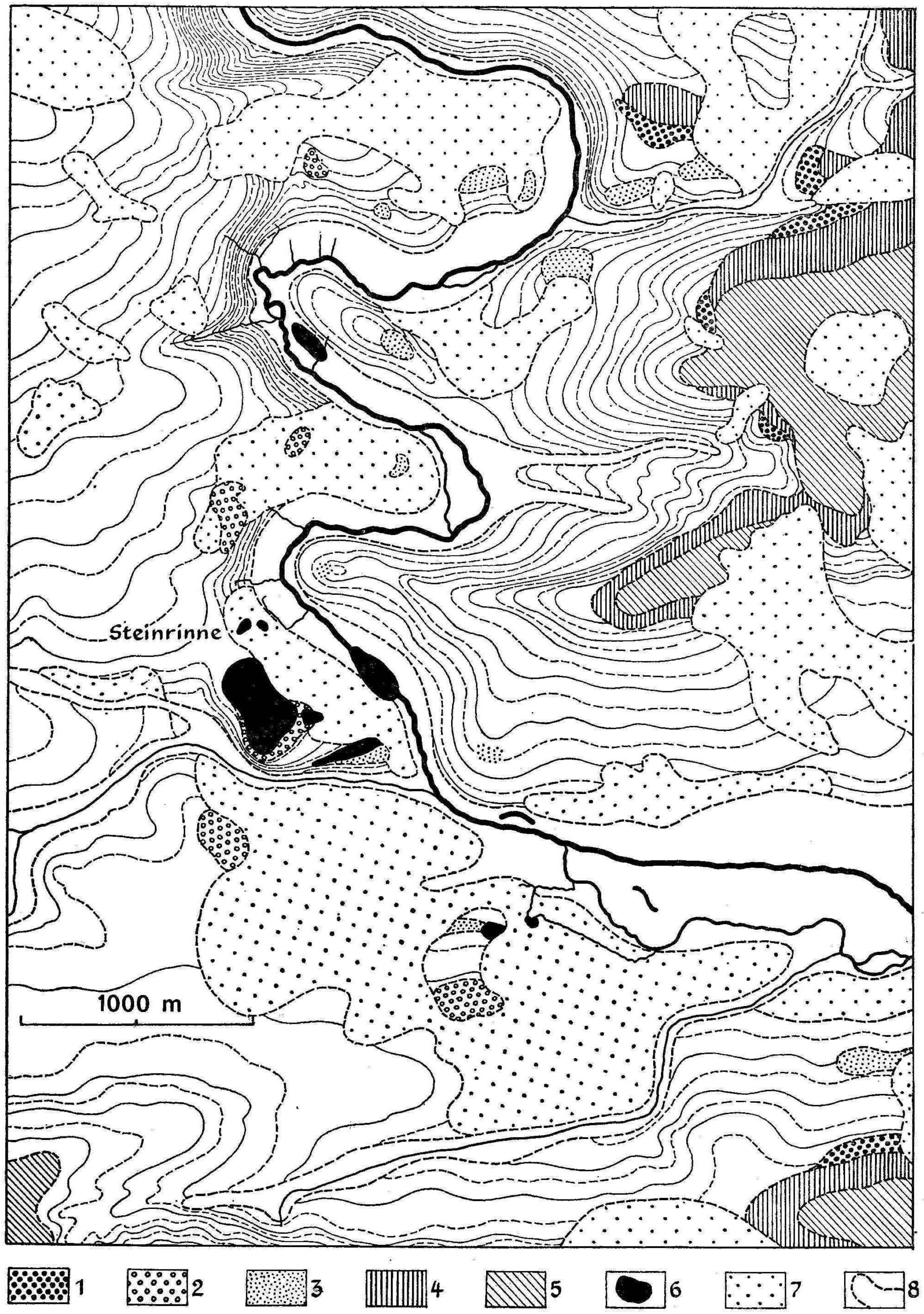


FIGURE 1. *Bilzingsleben. The geographical relations of the site to the marginal zones of the North European glaciations. 1 Elster glaciation, 2 Saale glaciation.*

Numerous specialists have agreed to cooperate in the study of the Bilzingsleben site. For this reason we express our gratitude to them. They are: M. Altermann, Halle (Sedimentology, Geology), G. Behm-Blancke, Weimar (Artifacts showing deliberate engravings), J. Burdukiewicz, Wrocław (Typology and Morphology of the artifacts), K. Brunnacker, Köln (Chronology), G. A. Cubuk †, Düsseldorf, K. Diebel †, Berlin (Ostracods), K. Fischer, Berlin (Castorides, Bovides, Suides), B. Gramsch, Potsdam (Wear traces on silex artifacts), H. Grimm, Berlin (Anthropology), E. W. Guenther, Ehrenkirchen (Elephants), W. Heinrich, Berlin (Micromammals,



Castorides), H. Hebig, Dresden (Fishes), K. D. Jäger, Halle (Chronology), P. Lange, Weimar (Sedimentology), D. H. Mai, Berlin (Foral remains), R. Musil, Brno (Equides, Ursides), T. Nötzold †, Berlin (Charophytae), Erika Pietrzeniuk, Berlin (Ostracods), H. Süß, Berlin (Wood remains), V. Toepfer, Halle (Archaeology, Palaeontology), E. Vlček, Praha (Anthropology), T. Weber, Halle (Archaeology), F. Wiegank, Potsdam (Palaeomagnetism, Chronology).

1. GEOLOGY AND CHRONOLOGY

The archaeological horizon is enclosed in a travertin complex situated on Middle Pleistocene terraces about 30 m above the level of the modern Wipper valley (Mania 1980, 1983a) (*fig. 2*).

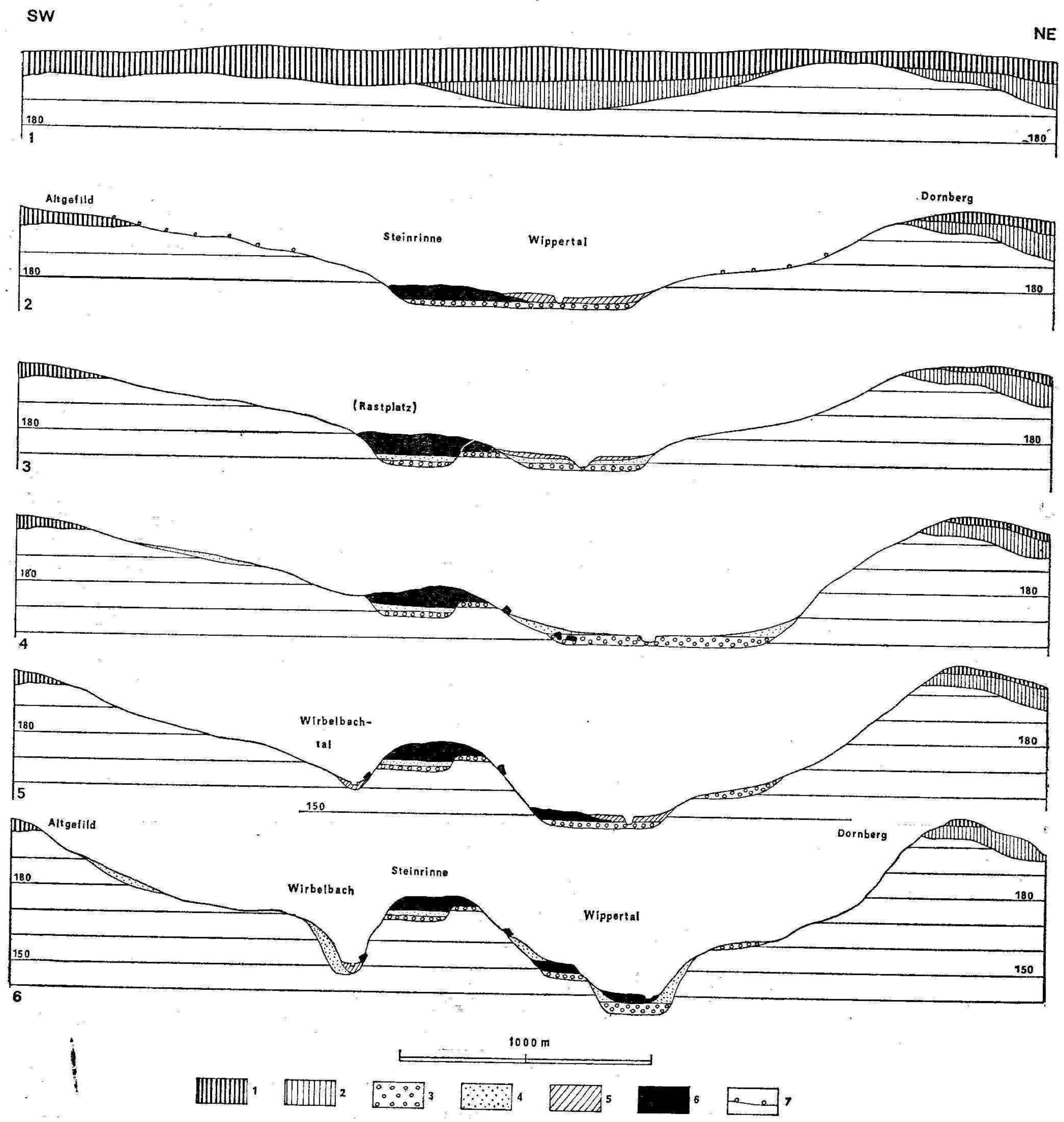


FIGURE 2. *Bilzingsleben. Morphological and quaternary-geological situation. Steinrinne: The site.* 1 *river gravels of the terraces at 40—50 and 60—70 m,* 2 *river gravels of the terraces at 26—32 m,* 3 *river gravels of the terraces at 5—10 and 15—20 m,* 4 *glacial basin silt (Elster),* 6 *travertin depositions,* 7 *loess (Weichsel),* 8 *colluvium in the valleys.*

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FIGURE 3. *Bilzingsleben. Geological development of the Wipper valley. Steinrinne: The site.* 1 *phase of the maximal glaciation, Elster,* 2 *Holstein,* 3 *Dömnitz,* 4 *Saale (Drenthe),* 5 *Eem,* 6 *holocene/today.*
1 *ground moraine,* 2 *glacial basin silt,* 3 *river gravels,* 4 *loess,* 5 *colluvium,* 6 *travertin,* 7 *denudation area.*

This travertin was uncovered in the late ice age through denudation process leading to the relief inversion. The geological sequence and the age of the travertin complex of Bilzingsleben can be explained by means of the terrace stratigraphy (*figs. 2–3*). On the whole, seven quaternary valley floors were discovered in the surrounding of the site the most ancient ones being situated today at 60 and 45 m resp. above the level of the actual valley floor. The 45 m terrace formed at the beginning of the Elster Mindel glacial is bearing the glacial beds of the Elster glaciation. In the region between Elbe and the "Mittelgebirge" mountains this terrace is called First glaciation terrace. The following terraces at 32 and 27 m resp. above the level of the actual valley floor carry the travertin complex. Its composition will be described later. A further river terrace is formed at 20 m corresponding to the Second glaciation terrace with the glacial beds of the Saale glaciation situated on this terrace. This enables geologists to date the terrace to the beginning of the Saale/Riß glacial period. A river terrace 10 m above the level of the actual valley floor belongs to the later part of the Saale/Riß glacial and is covered with deposits of the Eem interglacial. The latest terrace situated today below the level of the actual valley floor is derived from the Weichsel glacial.

According to this terrace stratigraphy, the travertin complex must be placed into the period between the Elster/Mindel and the Saale/Riß gla- iations. We call this the "Holstein complex". In the northern region of the "Mitelgebirge" mountains it consists of two interglacials separated by a glacial of minor intensity. These places were given local names. The following survey shows the division clearly:

Saale/Riß glacial	
Holstein complex	*upper interglacial* (*Dömnitz*) *Fuhne glacial* *lower interglacial* (*Holstein*)
Elster/Mindel glacial	

This division can be recognized in the travertin complex of Bilzingsleben (*fig. 4*). A more ancient travertin series formed on the river terrace 32 m above the level of the actual valley floor belongs to the Holstein interglacial. A later travertin series situated on the river terrace at 27 m represents the Dömnitz interglacial containing the archaeological horizon with the remains of Homo erectus. Due to conditions of cold climate (solifluction sediments, loess) the river gravels on the 27 m terrace including overlying sediments represent the Fuhne glacial (*fig. 5*). Both travertin series are lying close together the later series comprising the major portion of the travertin complex. Several datings of the 230/Th method yielded extremely different values (Harmon et al. 1980, Brunnacker et al. 1983, Mania 1983b). Thus, one vertical series from measured samples yields high values for sediments lying stratigraphically over the lower ones. On the whole, the age oscillates between 150 000 and > 350 000 years B. P. Consequently, not being able to consider these results as reliable we are inclined to adopt the relative stratigraphic position of the archaeological horizon in the period between the Elster/Mindel and the Saale/Riß glaciation corresponding to an estimated age of about 300 000 years. This chronological positionining is supported by diverse palaentological facts. Among the travertin flora, Celtis occurs accompanied by Pyracantha coccinea, Buxus sempervirens and Syringa josikaea (Mai 1983). Middle Pleistocene species of the vertebrate fauna are Macaca sp., Trogontherium cuvieri and Arvicola cantiana (Mania 1983c, Heinrich 1983). The mollusc assemblages are represented by some species which as concerns the Elbe-Saale region could only be observed in the Middle Pleistocene times (Pseudalinda turgida, Iphigena tumida, Theodoxus serratiliniformis) and are associated with Helicigona banatica, Aegopis verticillus, Discus perspectivus and others. As for the occurrence of ostracods Scottia browniana and Microdarwinula zimmeri could be identified (Diebel and Pietrzeniuk 1980).

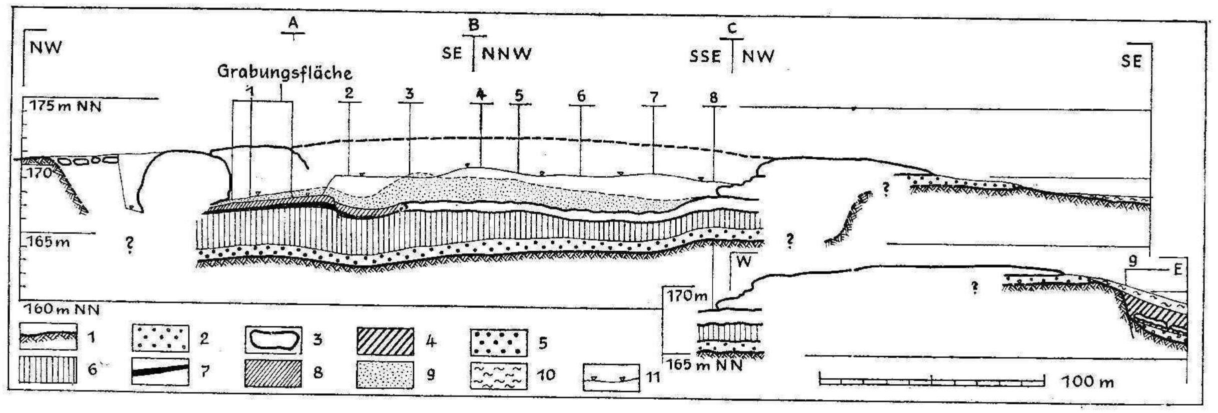


FIGURE 4. *Bilzingsleben. Geological section through the site. 1 pre-quaternary ground, 2 interglacial river gravels, 3 travertin, 4 lithic sediments, 5 glacial river gravels, 6 loess, 7 travertin sand = horizon of finds, 8 lacustrine limestone, 9 loose travertin, 10 colluvium, 11 exploitation bottom of the quarry.*

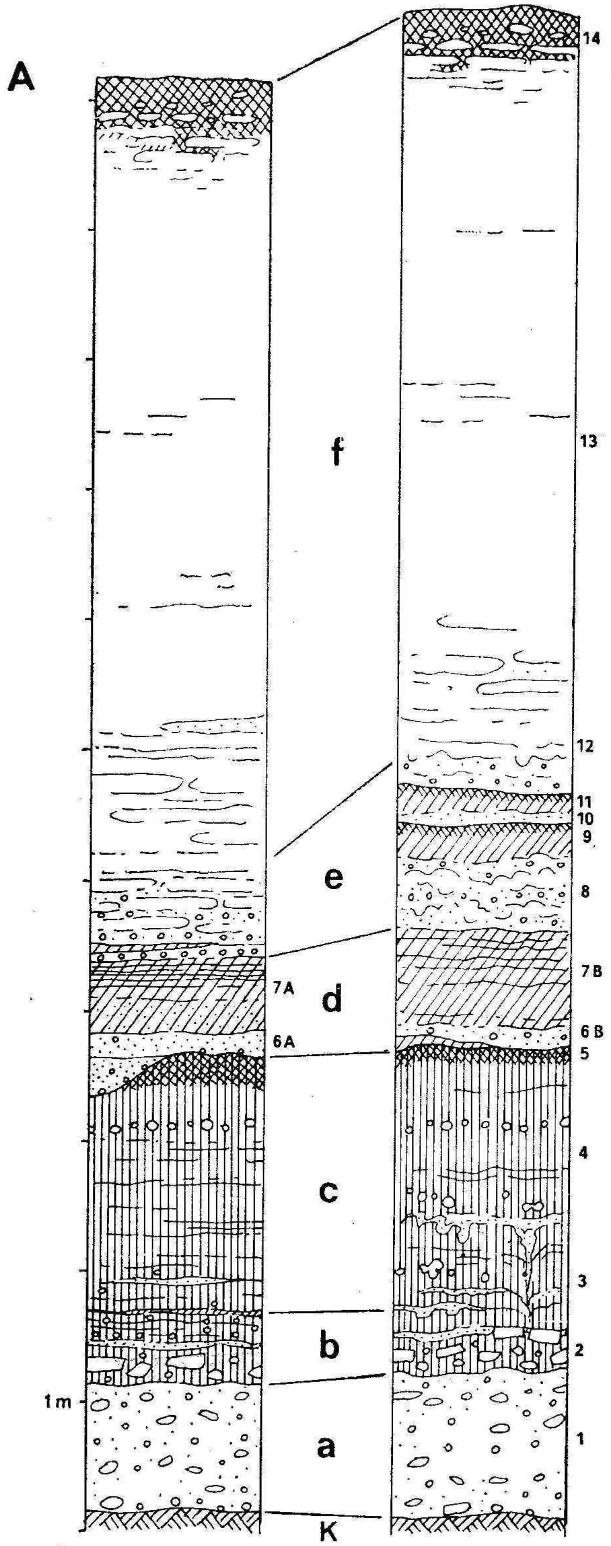


FIGURE 5. *Bilzingsleben. Geological build-up of the travertin series of the site. a—c glacial series (a terrace, b horizon of soilcreep, c loess), d—f interglacial series (d diluvial fan) and lacustrine limestone, e loose travertin, f solid travertin.*
1 river gravels, 2 silt containing rock debris, 3 silt containing sand, 4 silt, 5 pseudogley, 6 travertin sand = horizon of finds, 7 lacustrine limestone (chara-limestone), A loose, B solid, 8 loose structure travertin (Chara-, moss-, Phragmites travertin), 9/11 lacustrine limestone containing humus zone, 10 travertin sand, 12 loose travertin, 13 solid structure travertin (containing leaves another plant remains).

2. THE ARCHAEOLOGICAL—GEOLOGICAL SITUATION

The archaeological horizon situated in basal sediments of the travertin series was formed by the ancient land surface the latter lying on loess consisting of travertin (*fig. 5*). A powerful layer of limnic limestone of 50 to 80 cm was deposited on the archaeological horizon with 6 m of travertin covering the limestone. The extension of the upper travertin series displays a shallow basin 300 m long and 200 m wide and her the deposition of travertin took place.

In the western part of the basin there was a source, a powerful artesian karst spring (*figs. 6–7*). East of it lay the archaeological horizon situated in the region of the mouth of the brooklet at the shore of a shallow lake. These two areas of sedimentation caused the formation of the two types of facies containing the palaeolithic finds (*fig. 8*).

a. *Diluvial fan facies*

After a short course the spring feeding a brooklet led into a lake, where it deposited a diluvial fan consisting of travertin sand. Numerous creek troughs were preserved there. The diluvial fan contained a great number of finds which, however, were for the most part not in primary position. Only large and heavy objects can be assumed to have been in primary situation.

b. *Shore facies*

South of the diluvial fan, there was a more or less horizontal flat zone formed by loess. The shore could be recognized as a steep slope of 30–50 cm. This marginal terrace was an ideal occupation floor in the vicinity of the spring, of the mouth of the brooklet and of the lake. The finds there were, for the most part, of autochthoneous nature. Only smaller objects of 50 cm can be considered as partially redeposited. With the marginal terrace flooded Palaeolithic man was forced to give up this camping site. The travertin formation caused the level of the lake to rise and then this deluge set in which, according to the minor traces of weathering on the surface of the finds, must have taken place in a rapid way.

The calcareous sediments were also favourable for the preservation of bones, teeth and antlers. The following types of finds occur:

Human remains.
Artifacts of silex.
Artifacts of stones other than silex (pebble tools).
Artifacts of bone.
Artifacts of antlers.
Artifacts of ivory.
Artifacts of calcified wood.
Artifacts showing deliberate engravings.
Skeletal remains of hunted animals.
Remains of gathered food.
Structures of dwellings.
Working places.
Various zones of activity.
Hearths (charcoal, stones showing influence of fire).

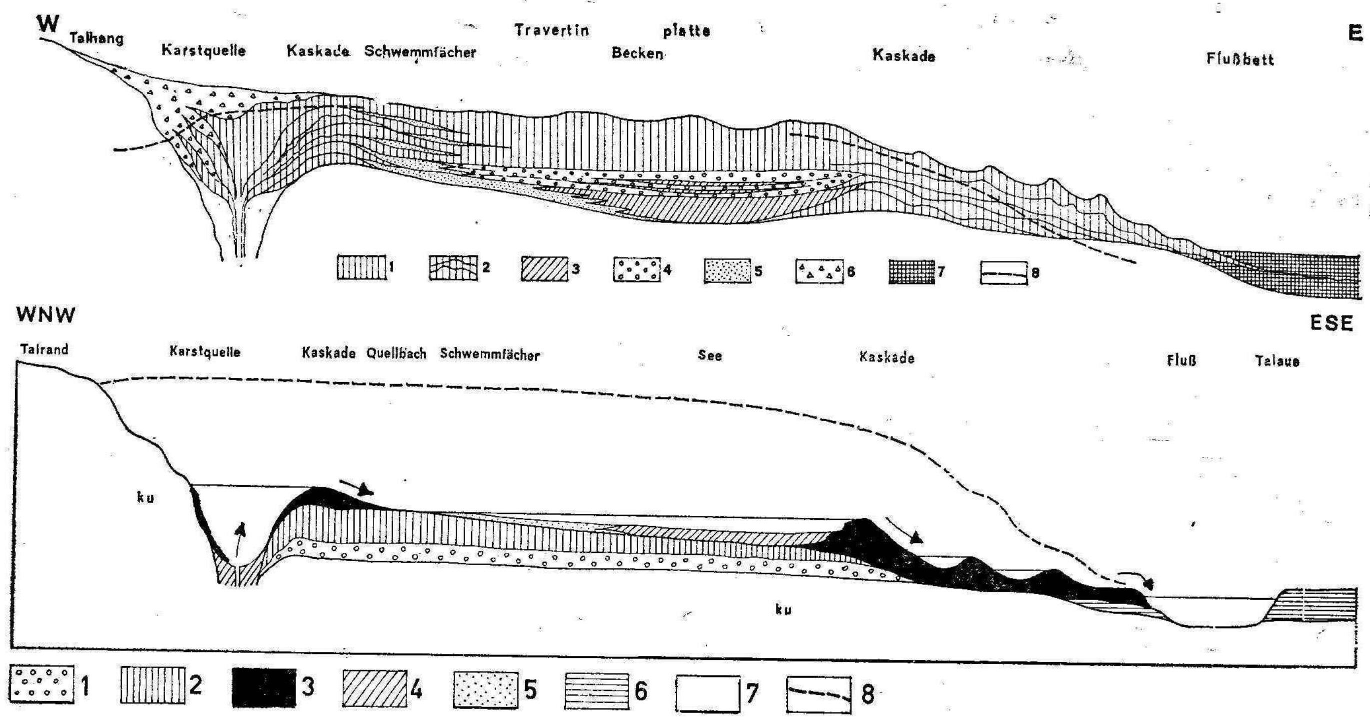


FIGURE 6. *Bilzingsleben. Rough scheme of the geological composition of the travertin series. 1 solid travertin, 2 cascade travertin in layers, 3 lacustrine limestone, 4 loose travertin, 5 travertin sand = horizon of finds, 6 slope debris, 7 valley sediments, 8 actual surface of the travertin series at the end of sedimentation.*

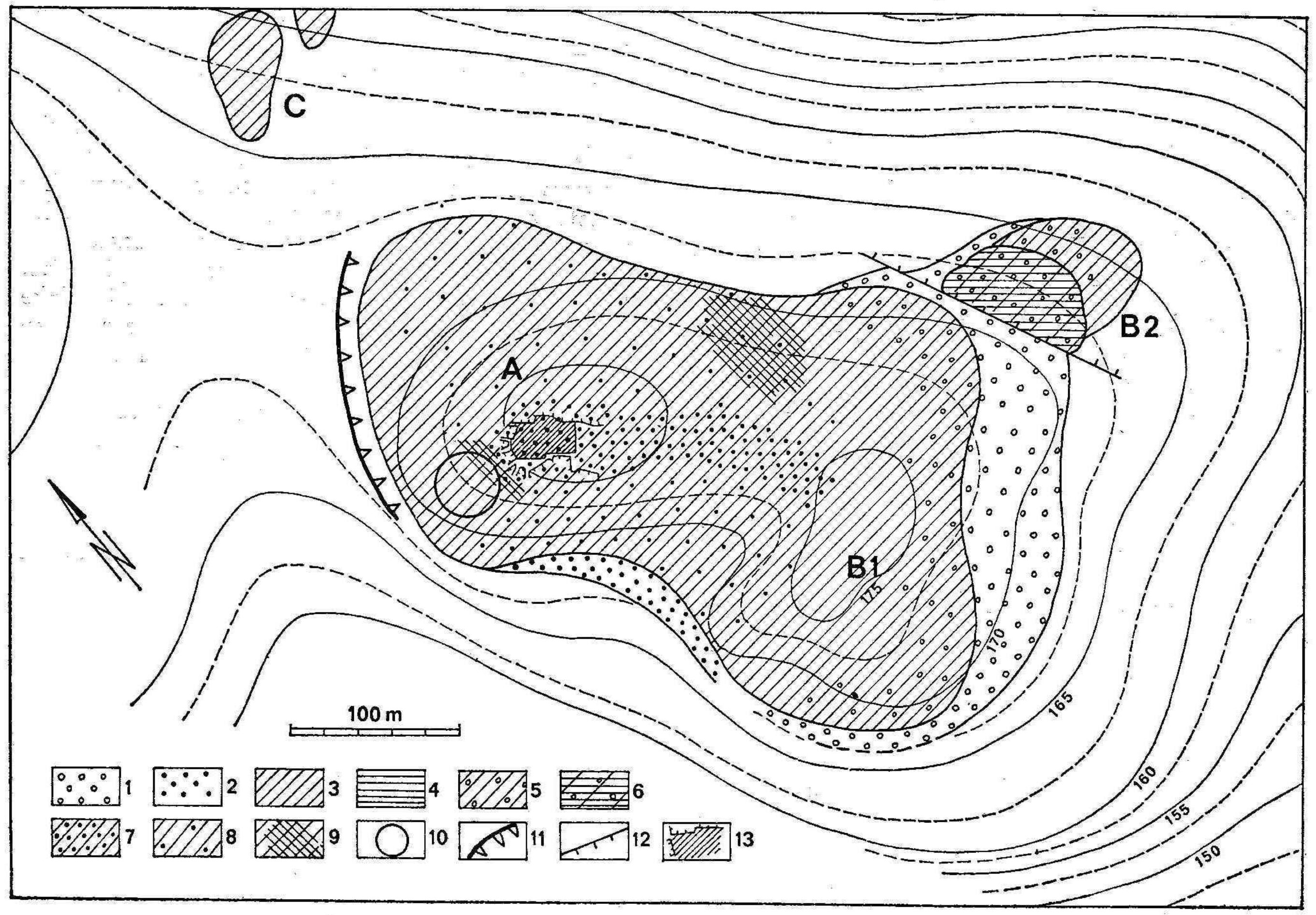


FIGURE 7a. *Bilzingsleben. Geological map of the site. 1 river gravels of the terrace at 30—32 m above the flood plain, 2 river gravels of the terrace at 26—27 m. 3 travertin A: late series (Dömnitz), B1, 4 B2 early series (Holstein), 5 gravels overlaying the early travertin, 6 the same under B2, 7 gravels underlying the late travertin, proved, 8 supposed, 9 cascade travertin, 10 vicinity of the karstique spring, 11 river valley bank slope, 12 dislocation, 13 area of excavation.*

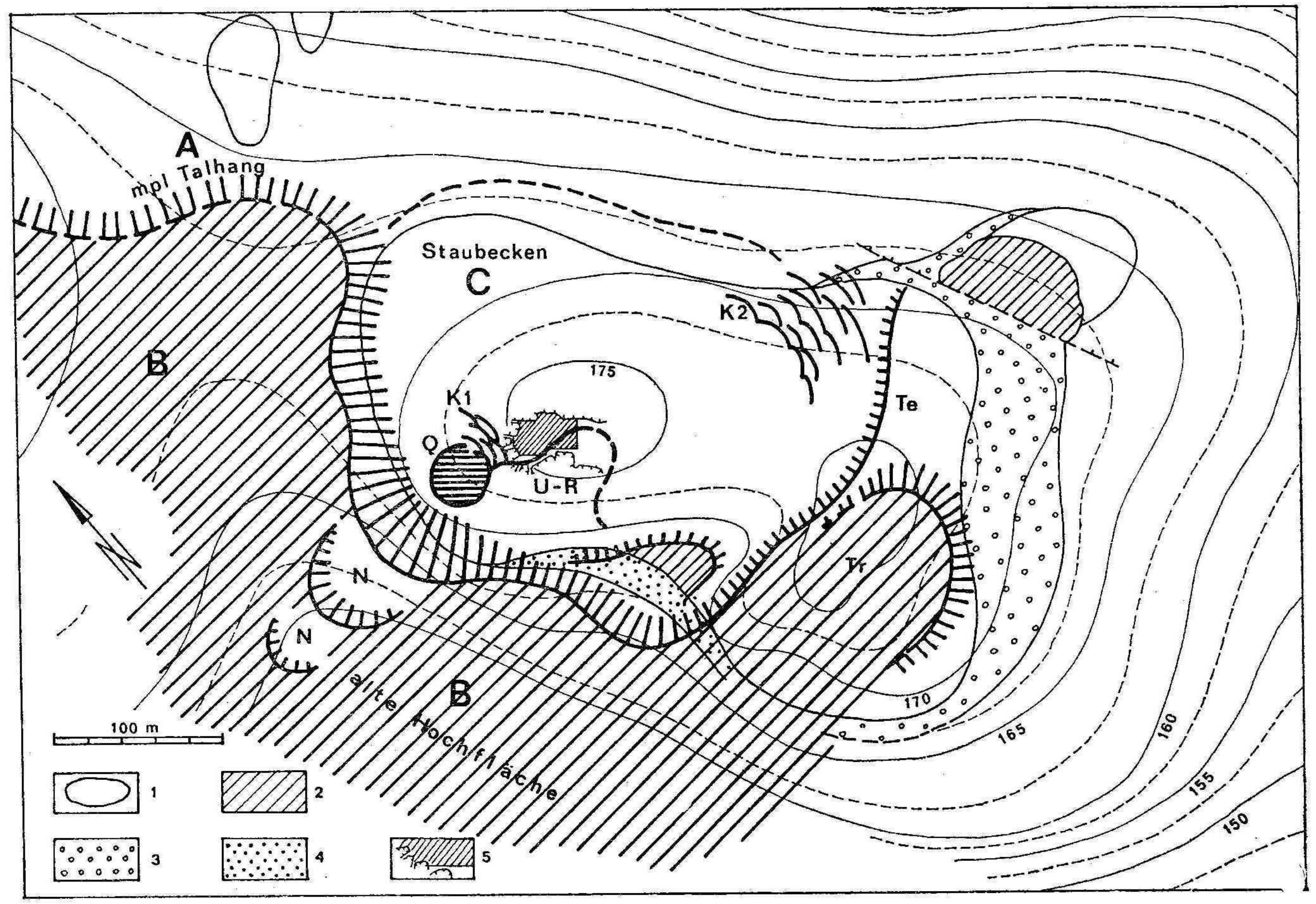


FIGURE 7b. *Palaeogeographical map of the site. 1 distribution of the travertin, 2 basin sediments of the early series, 3 river gravels of the early series, 4 river gravels of the late series, 5 area of excavation. A river valley slope, B Middle Pleistocene plateau, C lake basin, Q spring niches, Tr—the early terrace-travertin complex, U—R lake-edge zone, occupation floor of Homo erectus.*

Evidence of the ancient environment (geological, geomorphological evidence, travertin flora, vertebrate fauna, molluscs, ostracodes).

3. MIDDLE PLEISTOCENE HOMINID FINDS FROM BILZINGSLEBEN (*EMANUEL VLČEK*)

Up to the present time the excavation of the lower palaeolithic archaeological horizon preserved in travertin near Billzingsleben yielded nine skull fragments and six molars of fossil man (*fig. 8*). The first find was a larger fragment of Os occipitale (A1) uncovered in 1972, but not recognized until 1974. In the same year, a second fragment of Os occipitale (A2) was added. In 1976, the middle fragment of Os frontale (B1) was unearthed. Further remains of Os frontale (B2, B3) were found in 1976 and 1979. One fragment of Os parietale was uncovered in 1977. In 1984, a small cranium fragment, not yet determined, probably belonging to Os parietale, was discovered. The molar teeth from the mandible (E1, E2), one milk molar and another molar are finds of 1976 and 1982—1985. The cranium fragment of 1984, the milk molar of 1984 and one molar tooth of 1985 are being investigated at the moment and thus will be described in another paper.

In some preliminary accounts the great importance of the hominid finds from Bilzingsleben had already been announced. In the present chapter the state of preservation of the uncovered hominid skull fragments will be described. Then the diagnostic characteristic for each specimen will be determined. They will be evaluated according to the range of variation of the corresponding features such as we know them from the already known earlier lower palaeolithic hominid finds in order to assess the phylogenetic position of the Bilzingsleben finds. Studying the above mentioned remains taxonomically, we will use those characteristics which have proved to be important in the phylogenetical research of man as far as they are still recognisable at the fragmentarily preserved original pieces. Our study of the Bilzingsleben finds was supported in an important way by a close cooperation with palaeoanthropologists and by personal studies, e.g. in institutes and collections in Halle, Weimar, Jena, Moscow, Leningrad, Tbilissi, Budapest, Frankfurt (Main), Tübingen, Stuttgart, Düsseldorf, Rome, Paris, Monaco, Vienna and Tokio. Part of the comparative material could be studied as original specimens in Weimar, Jena, Halle, Budapest, Prague, Brno, Paris, Vienna, Moscow, Leningrad, Frankfurt (Main) and Rome. Another part was analysed with the help of casts. The study material of modern man was at our disposal in the National Museum of Prague and in the Anatomical Institute of the Charles University of Prague.

First I want to express my gratitude to the Landesmuseum für Vorgeschichte in Halle/Saale for helping me to carry out this study of hominid remains from Bilzingsleben. I am also particularly thankful to the director of this museum Dr. D. Kaufmann as well as to the director of the National Museum of Prague, Dr. A. Cejchan for their support of my investigation of Middle Pleistocene hominid finds from Bilzingsleben. Furthermore, I want to thank the following colleagues: Dr. V. Toepfer, Halle/Saale, Prof. Dr. Dr. Grimm, Berlin and Dipl.-Ing. G. A. Cubuk, Düsseldorf (†) for their interesting discussions; Prof. Dr. G. Behm-Blancke and Dr. habil. F. Feustel, Weimar, for delivering me the casts of the hominid remains from Ehringsdorf as well as Prof. H. de Lumley and Madame M. A. de Lumley, Marseille, for their delivery of casts of the Arago skull, which, in the present study, were used as comparative study material. Furthermore, I am thankful to the director of the Anatomical Institute of the Charles University of Prague, Dr. Dr. R. Cihak for giving me the permission to use the study material of his institute.

3.1. *Material and method*

This study examines the eight remains of Homo erectus from the "Steinrinne" near Bilzingsleben which were uncovered recently in the period of 1972 until 1982. They were derived from the archaeological horizon of zone 1 and were situated in the region of the diluvial fan (A1, A2, B1, B2, B3, C1) and on the marginal terrace (C2, D1) (*fig. 8*).

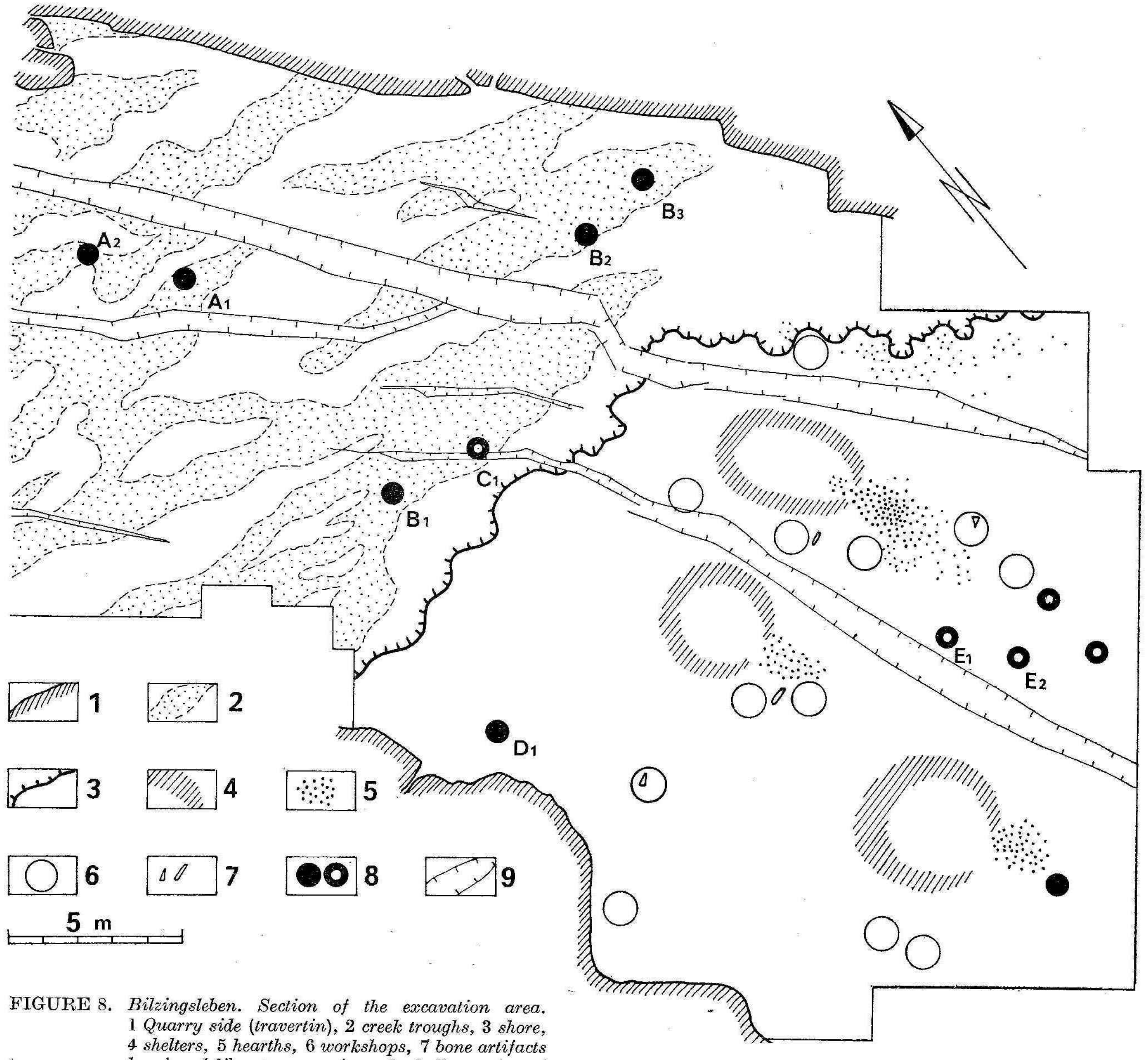


FIGURE 8. *Bilzingsleben. Section of the excavation area. 1 Quarry side (travertin), 2 creek troughs, 3 shore, 4 shelters, 5 hearths, 6 workshops, 7 bone artifacts bearing deliberate engravings, 8 skull remains of Homo erectus (A1, A2, B1-3, D1) and teeth, (C1, E1, E2), 9 crevices.*

3.1.1. *Particular dates of discovery of the hominid remains*

The finds were given special names. Capital letters mark the cranium bones and number indices determine their fragments.

Bilzingsleben A1: Large fragment of Os occipitale. It was found on 22nd October, 1972 in the square metre plot n. 82 and it was identified during preparational works of the finds on 17th April, 1974. Grimm, Mania and Toepfer 1974, Mania and Grimm and Vlček 1976, Mania 1975, 1976a, b, Landesmuseum für Vorgeschichte Halle/Saale, HK 74: 206a.

Bilzingsleben A2: A relatively small fragment of Os occipitale. Fracture surface matching closely into the left fracture surface of item A1. Mania 1975, 1976a, b, Mania, Grimm and Vlček 1976. LMV Halle HK 74: 206b.

Bilzingsleben B1: Fragment of the central part of Os frontale. Found on 15th July, 1975 in the square metre plot no. 113. Mania 1975, 1976a, b, Mania and Grimm 1976, Mania, Grimm and Vlček 1976. LMV Halle HK 75: 199.

Bilzingsleben B2: Upper fragment of Os frontale. Found on 25th August, 1976 in the square metre plot no. 150. Mania and Vlček 1979, Vlček 1980. LMV Halle HK 76: 529.

Bilzingsleben B3: Fragment of the left part of Os frontale. Found on 26th July, 1979 in the square metre plot no. 170. Vlček 1983a, b. LMV Halle HK 79: 1141.

Bilzingsleben C1: Molar tooth. Found in two fragments in the square metre plot no. 132 on 3rd July, 1976. Mania and Vlček 1979, Vlček 1980. LMV Halle HK 76: 530.

Bilzingsleben D1: Fragment of the right Os parietale. Found on 5th July, 1977 in the square metre plot no. 165. Mania and Vlček 1979, Vlček 1983b. LMV Halle HK 78: 772.

Bilzingsleben E1: Molar tooth. Found on 30th June, 1982 in the square metre plot no. 249. Vlček 1986. LMV Halle, Inventory Bilzingsleben no. 249, 25.

Bilzingsleben E2: Molar tooth. Found on 11th June, 1983 in the square metre plot no. 277. Vlček 1986. LMV Halle, Inventory Bilzingsleben no. 277, 33.

Bilzingsleben material not yet classified: Cranium fragment. Found in the square metre plot no. 327 on 19th August, 1984. LMV Halle, Inventory Bilzingsleben no. 327, 1.

Milk molar tooth. Found on 9th August, 1984 in the square metre plot no. 321. LMV Halle, Inventory Bilzingsleben no. 321, 952.

Molar tooth. Found on 27th July, 1985 in the square metre plot no. 339. LMV Halle, Inventory Bilzingsleben no. 339, 443.

3.1.2. *Description of the archaeological-geological situation of the hominid remains*

Bilzingsleben A1

The Os occipitale fragment was found associated with some very conspicuous items in a brooklet running from west to east in the area of the diluvial fan. Here the creek was about 1.20 m wide and 0.25 m deep. The embedding sediment consisted of yellowish fine and medium-grained travertin sands. Besides several small bone fragments there were numerous remains of red deer antlers in the trough. Four pieces belonged to a killed animal its antlers still showing remains of the skull. They are the lower parts of the right or left antlers, 50 cm long. Their crowns were deliberately broken off. The first prongs represent mattocks. Both lay in the creek- bed obliquely, in a parallel way, pointing in the same direction. The right prong pointed to the right, the left prong pointed to the left. Between the upper ends of the antlers' tools lay a strong antler-crown. Parts of the shaft were deeply pressed into the spongiosa by percussion indicating violent striking with a pebble tool. The fourth piece is the middle prong struck off from the antlers by a chopping tool used as a hammer-like tool on its widened base as is clearly shown by its utilization marks. All pieces belonged to a particularly strong stag.

Adjacent to that find, there were some remains of two relatively small antler fragments and a strong club-like antler, the basic fragment of a thin antler as well as some conspicuous tools nearby: a small antler dropped by a stag and worked by man like a pick and a large shoulder-blade worked like a spatula.

Directly to the left, that is on the northern bank of the creek trough Os occipitale lay between the piece of the antler-crown and an antler mattock with the base of the occipital bone pointing upside and its exterior part pointing to the north. The assemblage of the four antlers' pieces which were derived from only one stag was somewhat astonishing. One cannot imagine them being incidentally deposited in the creek-trough three pieces of them being used as tools with different functions. We suppose a deliberate action without knowing its precise meaning. We also have no idea whatever whether this assemblage had any relationship with the human skull or not.

Bilzingsleben A2

The second piece of Os occipitale was uncovered at 2.80 m north-west from the first item in the northern adjoining creek-bed under the travertin sand of the diluvial fan. It lay directly on the bottom of the creek-bed which consisted of loess and it was jammed between the slope of the creek ascending by 25 cm and a 15 cm ridge in the creek-bed. Again the sediment in the creek was a fine-grained, yellowish travertin sand. There were hardly any finds besides some splinters of bone and some flint artifacts. Only behind the ridge in the creek there was a limestone slab of about 35×25 cm vertically erected. The skull fragment lay on the basin silt with its concave inner side turned downside and with its convex outer side turned upside.

The items A1 and A2 belong to one and the same skull and may be easily pieced together with the fracture surface being relatively clean. Other rims of the specimens, e.g. Sutura lambdoidea are markedly rolled due to chemical weathering process. There are further relatively clean fracture rims at the lower parts of both pieces. It may be supposed that the item which was once larger and probably preserved as far as Foramen magnum had been submitted with its surface to a chemical weathering for some time and that it came to fall into the creek, broke there into pieces during transport and that the broken pieces were transported separated from each other.

Bilzingsleben B1

The middle fragment of Os frontale was uncovered in the diluvial fan which was 30 cm thick at this spot and consisted of coarser, medium-grained travertin sand. This item was excavated about 15 cm above the base of the diluvial fan. Along with other numerous bone remains, teeth and joint fragments the pieces of a size of 15—20 cm being the largest as well as with hundreds of flint artifacts it is part of the assemblage which was transported in a wide trough within the diluvial fan. Adjacent larger finds were an upper molar of an elephant, some rhinoceros molar teeth, jaw fragments of the bear as well as a rhinoceros shaft.

The frontal bone is hardly weathered its fracture surface being relatively clean.

Bilzingsleben B2

This second Os frontale fragment was found in the same position as the first one.

It also lays in the diluvial fan about 25 cm above its base. Here the fine- to medium-grained travertin sand of the diluvial fan was about 50 cm deep. It contained numerous large finds which were still almost all in their original position. The small, not much weathered Os frontale fragment as well as the great local abundance of the bone fragments and flint artifacts must be regarded as pieces transported in the diluvial fan.

Bilzingsleben B3

The piece was found in parautochthoneous situation in the diluvial fan lying in a shallow trough where the other parts of Os frontale and molar C1 were found as well.

Bilzingsleben C1

The first human molar was found in two fragments. Like the Os frontale fragment it was redeposited as a small find lying together with many other small finds in the middle of the diluvial fan which was 30 cm thick. The molar was, however, broken into two pieces when the material of horizon was sifted. Fortunately, its precise position in the diluvial fan could be localised exactly, but when sifted its root tips got lost.

Bilzingsleben D1

The Os parietale fragment was also uncovered at the living-floor on the marginal terrace. It was in original position between loosely scattered bone refuse of game animals partially belonging to a working place (e.g. an elephant shoulder blade utilized as an anvil).

Bilzingsleben E1

A further molar tooth was discovered in the region of the marginal terrace. It is regarded to be of primary nature though unfortunately it was uncovered at a secondary place in a gap of the travertin complex which was a few metres deep. The molar had probably dropped into this gap from the original place along with numerous other finds with some sandy material. Its relatively strong rate of corrosion is thought to be due to circulating underground waters in this gap.

Bilzingsleben E2

This molar was equally found on the marginal terrace. It was lying about 3 m south-east from E1 between numerous small bone splinters. The later finds of teeth not yet described also come from the spot in front of the dwelling objects.

3.1.3. *Our study methods*

The single human skull fragments of Bilzingsleben being rather scanty and of fragmentary nature their study broad needed comparisons. We advanced in the following way: At first, we tried to distinguish the characteristics of all fragments. Then we compared them with the corresponding features of the palaeolithic human finds with their known situation in the evolutionary line in order to reveal the whole variation scale of each character in the phylogenetical sequence of the genuses of Homo erectus and of Homo sapiens. Thus, we obtained a series of features by means of which the phylogenetic evolutionary standard and the taxonomic value of each character of the Bilzingsleben skull pieces could be recognized. Besides other preliminary considerations, the comparison of some important features has required to make sections on plaster casts of the fossil finds of Homo erectus and of Homo sapiens as well as of Pithecanthropus IV, Sinanthropus III, Olduvai-Hominid 9 and of the Vertesszöllös, Swanscombe, Steinheim, Arago and Ehringsdorf hominids. Thus, we can see that a direct comparison with corresponding sections of Os frontale and Os occipitale fragments of Bilzingsleben is possible. Another method of comparison consisted of fitting the casts of the two Bilzingsleben skull fragments into the skull casts of Pithecanthropus IV, Sinanthropus III and Olduvai Hominid 9. By this way, it was not only possible to place the specimens of the Bilzingsleben fragments anatomically, but also to recognize several possible variants of the original cranium form of the Bilzingsleben hominid. Its comparison with the frontal bone of the Arago skull and of the Ehringsdorf skull was preceded by their reconstruction. Thus, the identification of the Bilzingsleben hominid fragments became possible. These studies of comparison represent a significant contribution to the morphological differential diagnosis between Homo erectus and the European early forms of the Homo sapiens.

3.2. *Description of the skull remains*

3.2.1. *The morphology of Os occipitale, Bilzingsleben A1 and A2*

The state of preservation of the original piece

The hominid Os occipitale of Bilzingsleben can be pieced together with the uncovered fragments A1 and A2. It is 75 mm tall and 115 mm large. The present part of Os occipitale includes the complete Planum occipitale, Torus occipitalis and a great portion of

Planum nuchae. There is no hint whatsoever of the surrounding of Foramen magnum and of Corpus ossis occipitalis. Though the bone was not uncovered completely it still reveals some important diagnostical characteristics necessary for its description and its classification.

Morphological characteristics of Os occipitale

In the following chapters the single features will be described for the purpose of determining the Bilzingsleben hominid.

Planum occipitale (*fig. 9 above*)

In Bilzingsleben Man Planum occipitale is a low and large triangle which is 40 mm tall and 100 mm large. Squama ossis occipitalis rises into a flat Protuberantia lambdoidea below Lambda in the median sagittal line. Distally, there is a flattening of the outline of the occipital bone leading into a Depressio supratoralis. This depression ends in Sulcus supratoralis, on both sides arch-like formed. Through this Sulcus supratoralis, Planum occipitale is separated by the mass of Torus occipitalis. There is a distinct deepening for Musculus occipitalis which is above the lateral parts of Sulcus supratoralis at Planum occipitale. Not any traces of Lineae supremae were found on the exterior surface of Planum occipitale.

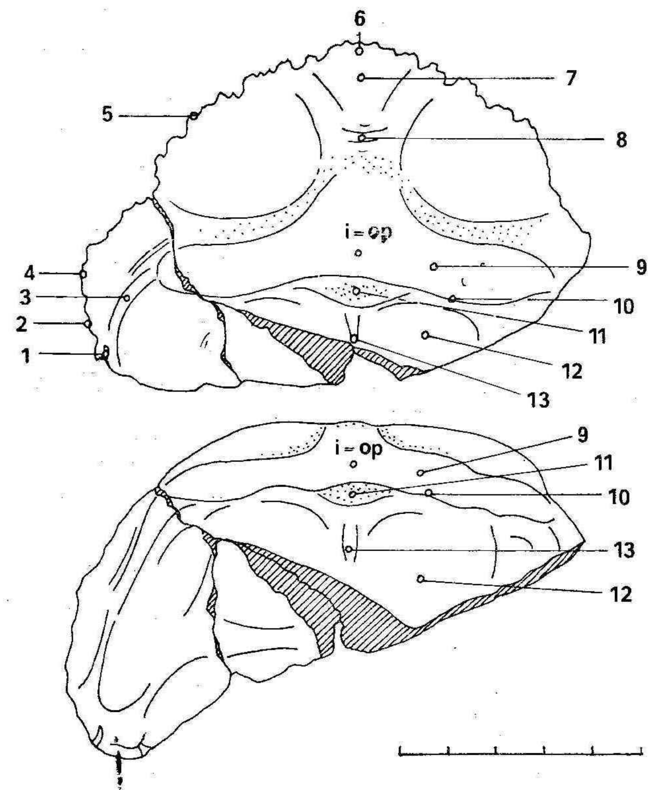


FIGURE 9. *Bilzingsleben. Os occipitale (A1 and A2). Norma occipitalis (at top) and Norma basilaris.* 1 *Sulcus occipitomastoideus,* 2 *Sutura occipitomastoidea,* 3 *Processus retromastoideus,* 4 *Asterion,* 5 *Sutura lambdoidea,* 6 *Lambda,* 7 *Protuberantia lambdoidea,* 8 *Depressio supratoralis,* 9 *Torus occipitalis,* 10 *Linea nuchae superior,* 11 *Depressio supratoralis,* 12 *Impressio muscularis,* 13 *Crista occipitalis externa.*

Torus occipitalis (*fig. 9 and 10*)

As to its typical configuration Torus occipitalis is equivalent to that defined by F. W. Weidenreich. The mass of Torus occipitalis is an elevation (82 mm long, 19 mm tall) in the mediansagittal plane and 15 mm tall in the lateral parts. The lower rim of Torus occipitalis is moderately wavy and proximally drawn up in the median-sagittal plane so that the points of Inion and Opisthocranium coincide in the maximal vaulting of this elevation. Lineae nuchae superiores are included in this distal rim of Torus occipitalis and are not represented separately in the relief of the occipital scale. Laterally, Torus occipitalis continues gradually into an elevation with Lineae nuchae superiores the former passing on into Processus retromastoideus.

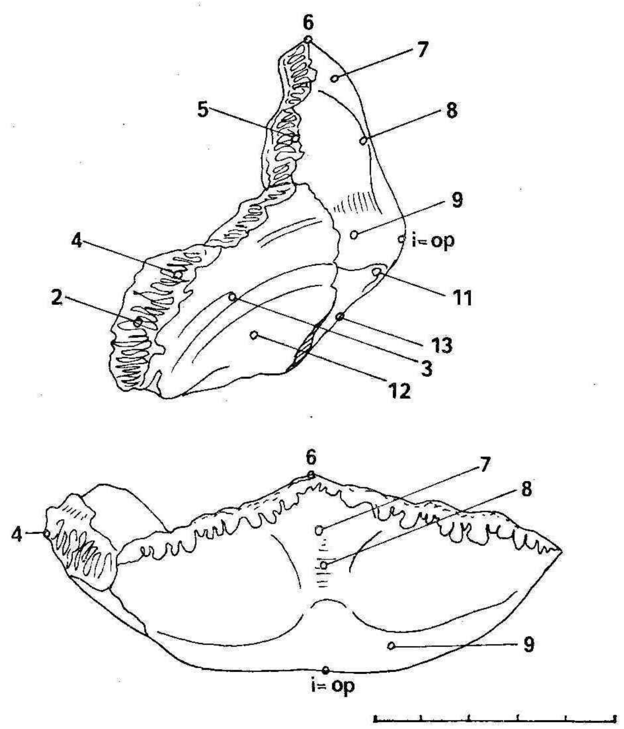


FIGURE 10. *Bilzingsleben. Os occipitale (A1 and A2). Norma lateralis (at top) and Norma verticalis. Explanations: fig. 9.*

Planum nuchae (*fig. 9 below, fig. 11*)

Planum nuchae is distinctly flat in the Bilzingsleben hominid. Together with Planum occipitale Planum nuchae forms an angle of inclination of 108°. In the median-sagittal plane, there is Depressio subtoralis with a rough base which is 30×8 mm large and is oriented obliquely and which is below the lower rim of Torus occipitalis. Here the beginning of a strong Ligamentum nuchae and the medial edge of the attachment of Musculus trapezius can be recognized. Below this formation, there is a low elevation in the sagittal plane, which is Crista occipitalis externa. Unfortunately, it is only preserved in a length of 15 mm.

Furthermore, Planum nuchae has a distinct muscle relief at both halves. Parasagittally, there is an elliptical deepening of 40×28 mm below the lower rim of Torus occipitalis which is divided by a low elevation. Here, Musculus semispinalis capitis was attached. In the laterodistal direction, there is a further deepening (18 mm large) corresponding to the attachment of Musculus obliquus superior. Medially and from these deepenings on, the upper edge of a further insertion surface for Musculus rectus capitis superior was preserved. Unfortunately, the other parts of Planum nuchae are missing.

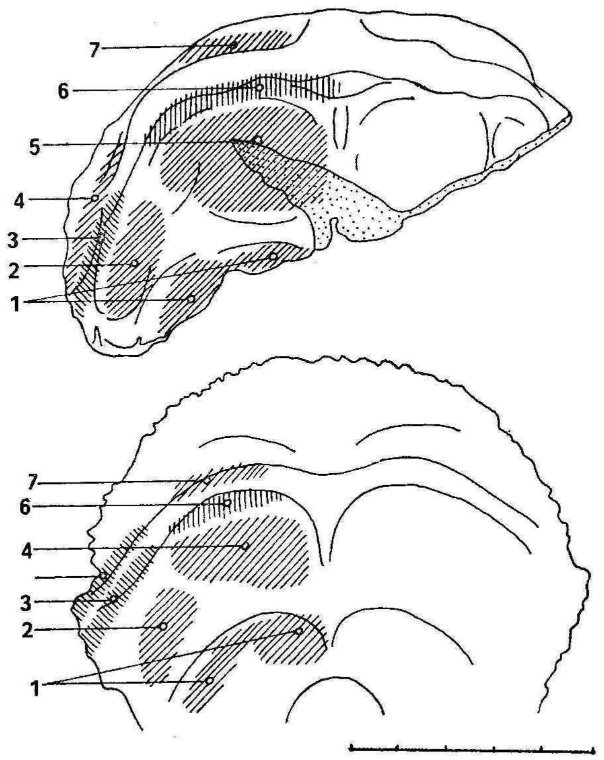


FIGURE 11. *Bilzingsleben. Os occipitale (A1 and A2) with attachments of muscles (at top) in comparison with Swanscombe skull. 1 Musculus rectus capitis, 2 M. obliquus, 3 M. splenius 4 M. sternocleidomastoideus, 5 M. semispinalis, 6 M. trapezius, 7 M. occipitalis.*

There are also muscular insertions at Processus retromastoideus. The rough bone surface of the proximally directed elevation of Lineae nuchae superiores indicates the attachment of a large Musculus splenius capitis. Parallel to it, there is a rough surface for Musculus sternocleidomastoideus and for other muscles.

The thickness of Os occipitale

A further, very conspicuous characteristic of Os occipitale from Bilzingsleben is its remarkable thickness (*table 1*).

Sutura lambdoidea and Sutura occipitomastoidea

On the fragment of Os occipitale of the Bilzingsleben hominid the left Sutura lambdoidea as well as the left Sutura occipitomastoidea are preserved. In conformance with its form and its suture excursion the Sutura lambdoidea is 108 mm long and agrees well with the Oppenheim type II/4. Pars lambdoidea is 26 mm, Pars media is 29 mm and Pars asterica is 42 mm long. The right Sutura lambdoidea is preserved in 69 mm length. Pars lambdoidea is 25 mm long.

TABLE 1. *The thickness of Os occipitale from Bilzingsleben*

1 in Lambda	11 mm
2 5 mm under Lambda	11 mm
3 in Depressio supratoralis	10 mm
4 on Torus occipitalis (i = op)	17 mm
5 in Depressio subtoralis	12 mm
6 at Crista occipitalis externa	12 mm
7 at Sutura lambdoidea (L1-L2)	10 mm
8 in Asterion region	16 mm
9 at Sutura occipitomastoidea	17 mm
10 in Sulcus supratoralis	8 mm
11 in the lateral region of the Torus occipitalis	12 mm
12 at Processus retromastoideus	15 mm
13 in Fossa cerebri	11 mm
14 in Fossa cerebelli	5 mm

TABLE 2. *The length of the parts of Sutura lambdoidea*

Pars lambdoidea (L1)	sin. 26 mm	dex. 25 mm
Pars media (L2)	29 mm	26 mm
Pars asterica (L3)	42 mm	18 mm remaining
Total length (L)	108 mm	69 mm remaining

Pars media is 26 mm long and from Pars asterica an 18 mm long part is preserved (*table 2*).

Only two-thirds of the width of Sutura lambdoidea correspond to the thickness of Os occipitale, as can be seen in *table 3*.

Sutura occipitomastoidea is only preserved on the left side. It is 25 mm long and very simply structured. Its width of 15 mm is relatively great compared to the bone thickness of 16 mm.

Facies cerebralis (*plate 1/d*)

From the relief of the endocranial surface on the preserved part of the Bilzingsleben Os occipitale the following characteristics can be recognized: On the uncovered fragment of Os occipitale the Fossae cerebrales and proximal parts of the two Fossae cerebellares are preserved. All these depressions are separated from each other by the course of the blood-vesssel furrows. The preserved Fossa occipitalis cerebralis dextra is 53 mm tall, the left Fossa is 52 mm tall and 55 mm wide. They both show Impressiones gyrorum and Juga cerebralia which correspond to Gyri occipitales superiores. The left Fossa cerebellaris is 50 mm wide and is preserved in a 20 mm tall piece. The right Fossa cerebellaris is so badly preserved that it cannot be measured. The surface of Fossae cerebellares is smooth.

The relief of the interior surface of Os occipitale can easily be recognized on the endocranial cast (*fig. 12*).

Metrical dates of Os occipitale

The fragment of Os occipitale contains the complete Planum occipitale and the larger part of Planum nuchae, especially the left side. Corpus ossis occipitalis and the surrounding of Foramen magnum are missing. So we cannot measure Os occipitale exactly.

TABLE 3. *The width of Sutura lambdoidea and the thickness of Os occipitale*

	sin.		dex.	
	Thickness of Os occipitale	Width of Sutura lambdoidea	Thickness of Os occipitale	Width of Sutura lambdoidea
Pars lambdoidea	10.0 mm	6.3 mm	9.6 mm	7.5 mm
Pars media	9.0 mm	6.0 mm	8.5 mm	5.0 mm
Pars asterica	15.6 mm	12.5 mm	9.3 mm*	5.0 mm*

* measured in the remaining part.

TABLE 4. *The measures of Os occipitale from Bilzingsleben*

	1 Martin	2 Weidenreich		measures
1	12	27	Maximum breadth of Os occip. (ast—ast)	—
2			Inion-Asterion chord (R)	76 mm
3			Inion-Asterion arc (L)	81 mm
4	28	60	Mediansagittal occipital arc (l ∩ o)	—
5	28(1)	70	Mediansagittal arc of upper Squama (L ∩ i)	53 mm
6	28(2)	72	Mediansagittal arc of lower Squama (i ∩ o)	40 mm remaining
7	27(3)	68	Lambda-Asterion arc (l ∩ ast)	100 mm
8	31	61	Mediansagittal occipital chord (l — o)	—
9	31(1)	71	Mediansagittal chord of upper Squama (L — i)	51 mm
10	31(2)	73	Mediansagittal chord of lower Squama (i — o)	39 mm remaining
11		69	Lambda-Asterion chord (l — ast)	86 mm
12	25	40	Index of curvature of Os occ. (31 : 28)	—
13	26	41	Index of curvature of upper Squama (31/1 : 28/1)	96.2 mm
14	27	42	Index of curvature of lower Squama (31/2 : 28/2)	—
15			Parietooccipital index (= 69 : 68)	86.0 mm
16			Index of length-breadth of Os occ. (12 : 28)	—
17			Index of length-breadth of upper Squama (12 : 28/1)	29.9 mm
18			Index of length-breadth of lower Squama (12 : 28/2)	—
19			Occipital angle (l — i ∢ i — o)	108°
20			Angle of the branches of Sutura lambdoidea	127—128°
21			Distance i : op from Crista occ. int.	17.0 mm

1 Martin, 2 Weidenreich

Table 4 shows the dates obtained. The greatest width of Os occipitale (ast-ast) had to be taken from the measurable left-side Inion-Asterion-Chord and the Inion-Asterion-Arc. Unfortunately, the occipital arc and the occipital chord are also not measurable.

Morphology of the back part of the endocranial cast

The form of the occipital parts of the endocranium (*fig. 12 above*)

The occipital region is remarkably characteristic on the cranial cast of Os occipitale from Bilzingsleben. Generally, it is rather angled. The occipital pole is considerably drawn out and shows no distinctly graduated transition to the cerebellum. When evaluating the region of the occipital part of the endocranial cast we used A. Kappers' method, which we also employed when studying the Gánovce endocranium (Vlček 1969). The evaluation was carried out in Norma lateralis by the establishing of the perpendicular on the so-called lateral horizontal line (LH), which Kappers leads tangentially to the orbital protrusion and

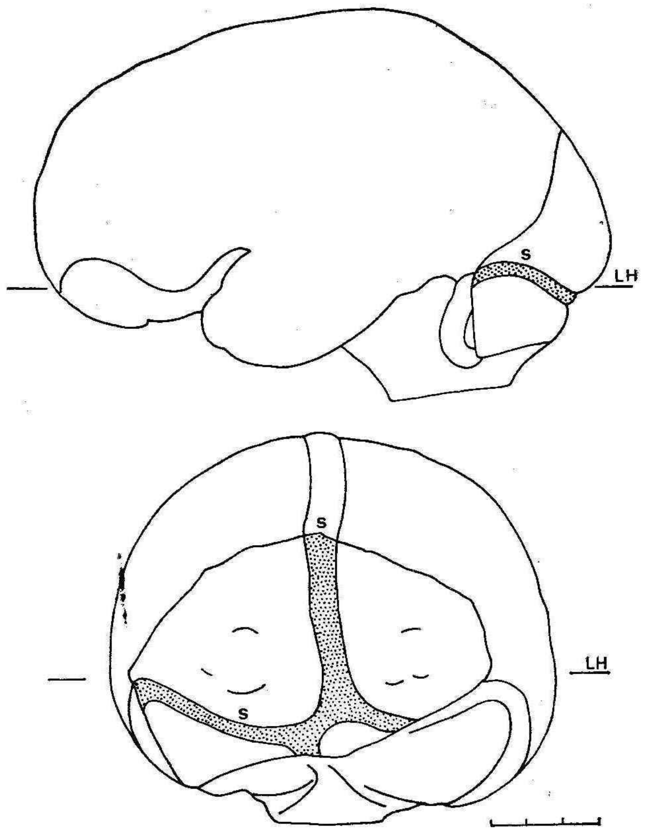


FIGURE 12. *Bilzingsleben. Endocranial cast (A1 and A2) put into Endocranium of Sinanthropus III. Norma lateralis (at top) and Norma occipitalis. S Sinus sagittalis and Sinus tranversus, LH Lateral horizontal line after A Kappers.* ◄

which corresponds exactly to the latero-ventral rim of the opercular region and to the base of Lobus occipitalis of the endocranium (*fig. 12*).

Above the lateral horizontal line, the vertical line of the occipital pole prominence (o) can be established before the beginning of the vaulting of the cerebellum hemisphere. From this point to the pole (o) on the LH the so-called length of the occipital pole prominence is measured. Thus, the surface is determined by this feature, too (*table 5*). The graphic

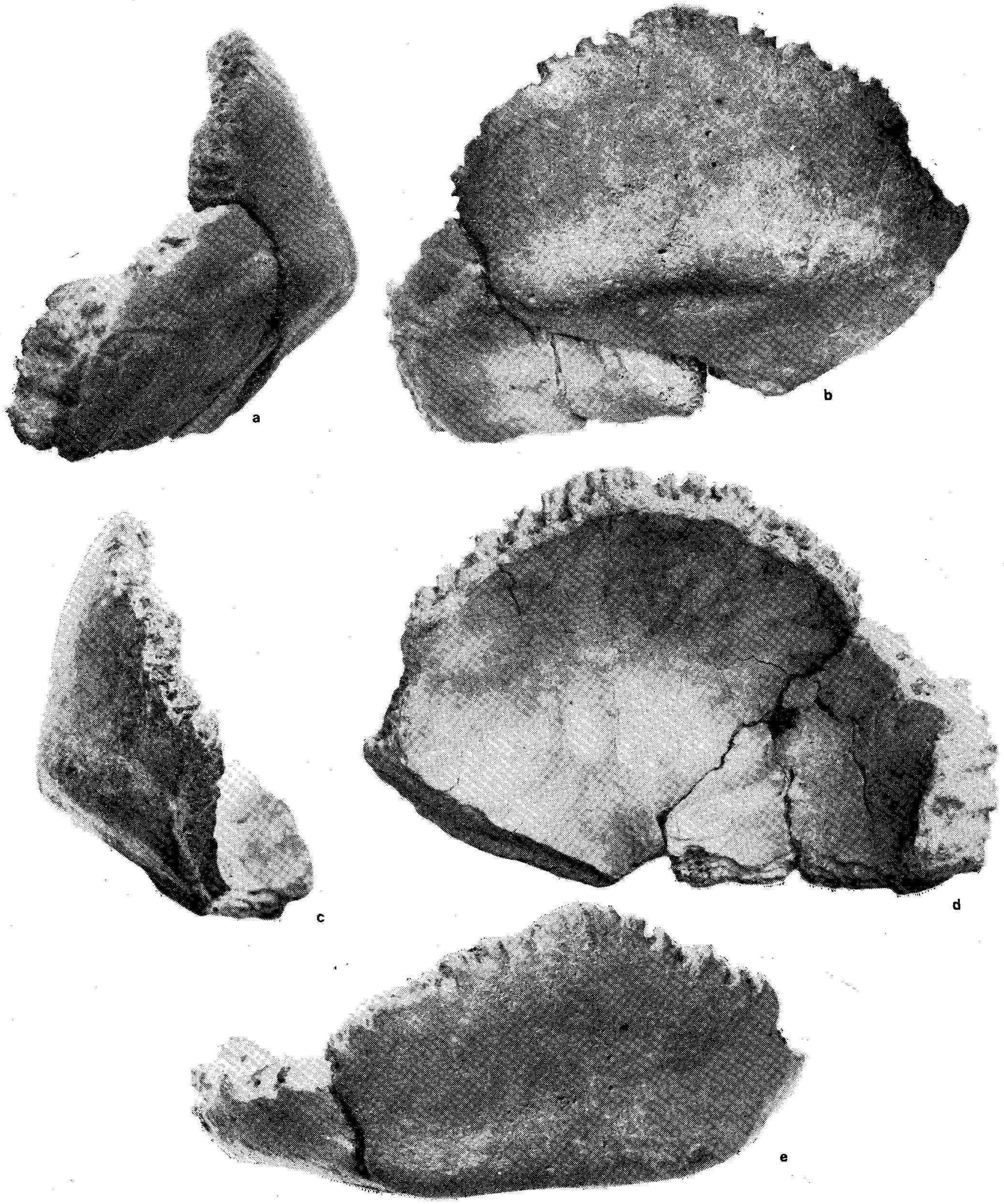


PLATE 1. *Bilzingsleben. Os occipitale (A1 and A2).* a *view from the left,* b *from the back,* c *from the right,* d *from the interior,* e *from top.* — 1 : 1.

TABLE 5. *Measures of the occipital area in the Bilzingsleben man (Vlček 1969)*

1 (h)	vertical line of the occipital pole protuberance, erected before the beginning of the curvature of cerebellum above LH	43 mm
2 (m)	length of the occipital pole protuberance	10 mm
3	Index of length-height of the occipital pole protuberance (m × 100 : h)	23.25

comparison of the occipital region from the Bilzingsleben hominid with a series of comparisons (*fig. 13*) roughly reveals the following relationships of the size and form of the external surface prominence of the neck poles: The hominid from Bilzingsleben exactly fits into the finds of Homo erectus, such as Pithecanthropus IV and II and Sinanthropus III. According to the arch-like formed neck curve the find from Vertesszöllös has to be ranged more closely to the Neandertal forms, whose neck curve is more convex and larger. The find from Pavlov I, e.g., shows already a bathrocephalic configuration of the neck region (*fig. 13*). Metrically, this phenomenon is quite well recognizable as a differential-diagnostic characteristic between Homo erectus and the ancient sapiens forms (*table 6*). The vertical height of the occipital prominence, measured above LH, has a variation width of 35—41 mm in Homo erectus, 44—52 mm in the Neandertal forms and it is even greater in modern men. With 43 mm Bilzingsleben fits well into the Pithecanthropus forms. Remarkably strange is the transitional form of erectus-sapiens from Broken-Hill

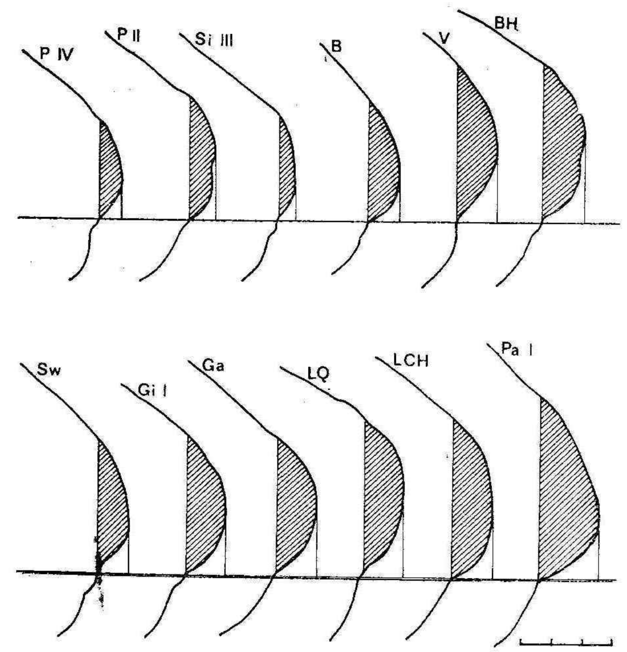


FIGURE 13. *Comparison of occipital region of Endocranium from Bilzingsleben with different fossil finds.* P IV, II *Pithecanthropus IV, II,* Si *Sinanthropus III,* B *Bilzingsleben,* V *Vértesszöllös,* BH *Broken-Hill,* Sw *Swanscombe,* Gi *Gibraltar I,* Ga *Gánovce,* LQ *La Quina,* LCH *La Chapelle,* Pa I *Pavlov I.*

TABLE 6. *Comparison of the measures of the occipital area of endocranium of Homo erectus with Homo sapiens*

	Vertical line of occipital protuberance above LH [mm]	Length of the occipital protuberance [mm]	Index of length-height of occipital pole protuberance
Pithecanthropus IV	35	8	22.58
Pithecanthropus II	41	9	21.95
Sinanthropus III	35	5.5	15.71
Bilzingsleben	43	10	23.25
Vértesszöllös	55	14	25.45
Broken-Hill	55	15	27.27
Swanscombe	45	10	22.22
Gibraltar I	46	13	28.26
Gánovce	44	14	31.81
La Quina	51	13	25.49
La Chapelle	52	13	25.00
Pavlov I	61	20	32.18

and from Vertesszöllös whose vertical height reaches 55 mm. This study of the characteristics of the occipital region of the endocranial cast of the Bilzingsleben hominid shows a great resemblance to the Pithecanthropus forms.

The relief of the occipital part of the endocranium (*fig. 12*)

The occipital pole of the endocranial cast is considerably drawn out. On the surface of the Fossa occipitalis cerebralis there are slight Impressiones gyrorum and Juga cerebralia corresponding to Gyri occipitales superiores. The surface of the endocranium above the Fossae occipitales cerebellares is smooth. Sulci venosi are distinctly developed. Sulcus sagittalis passes parasagittally to the right of the median-sagittal line. It is 45 mm long, 8 mm wide and it deepens 1—2 mm into the surface of Facies occipitalis cerebralis. Equally, Protuberantia occipitalis interna is situated parasagittally 12 mm to the right of the central line and forms a ridge of about 25 mm. The right-side Sulcus transversus, which is 8 mm wide and only preserved in a length of 26 mm, turns off from the upper part of this ridge. The left-side Sulcus transversus turns off from the lower rim of Protuberantia occipitalis interna in the median-sagittal plane, about 6 mm below the point where the right-side Sulcus turns off. Sulcus transversus sinister is only 4 to 5 mm wide and is indicated in a length of 35 mm. The lower part of Os occipitale being damaged Sinus occipitalis cannot be studied and the form of Confluens sinuum cannot be reconstructed.

3.2.2. *Morphological characteristic of Os frontale (Bilzingsleben B1, B2 and B3)*

The state of preservation of Os frontale

Three fragments of Os frontale were found on the "Steinrinne": One greater fragment of Os frontale derived from its central part (B1) and one smaller fragment derived from the upper and lateral part of Os frontale (B2 and B3, *plate 2*).

Bilzingsleben B1: It consists of Pars glabellaris, Torus supraorbitalis, Pars nasalis ossis frontalis and of one smaller piece derived from the upper part of Os frontale. Seen from the median-sagittal plane the fracture line is slightly lateral on the right side. On both sides the medial upper parts of the eye hole mar-

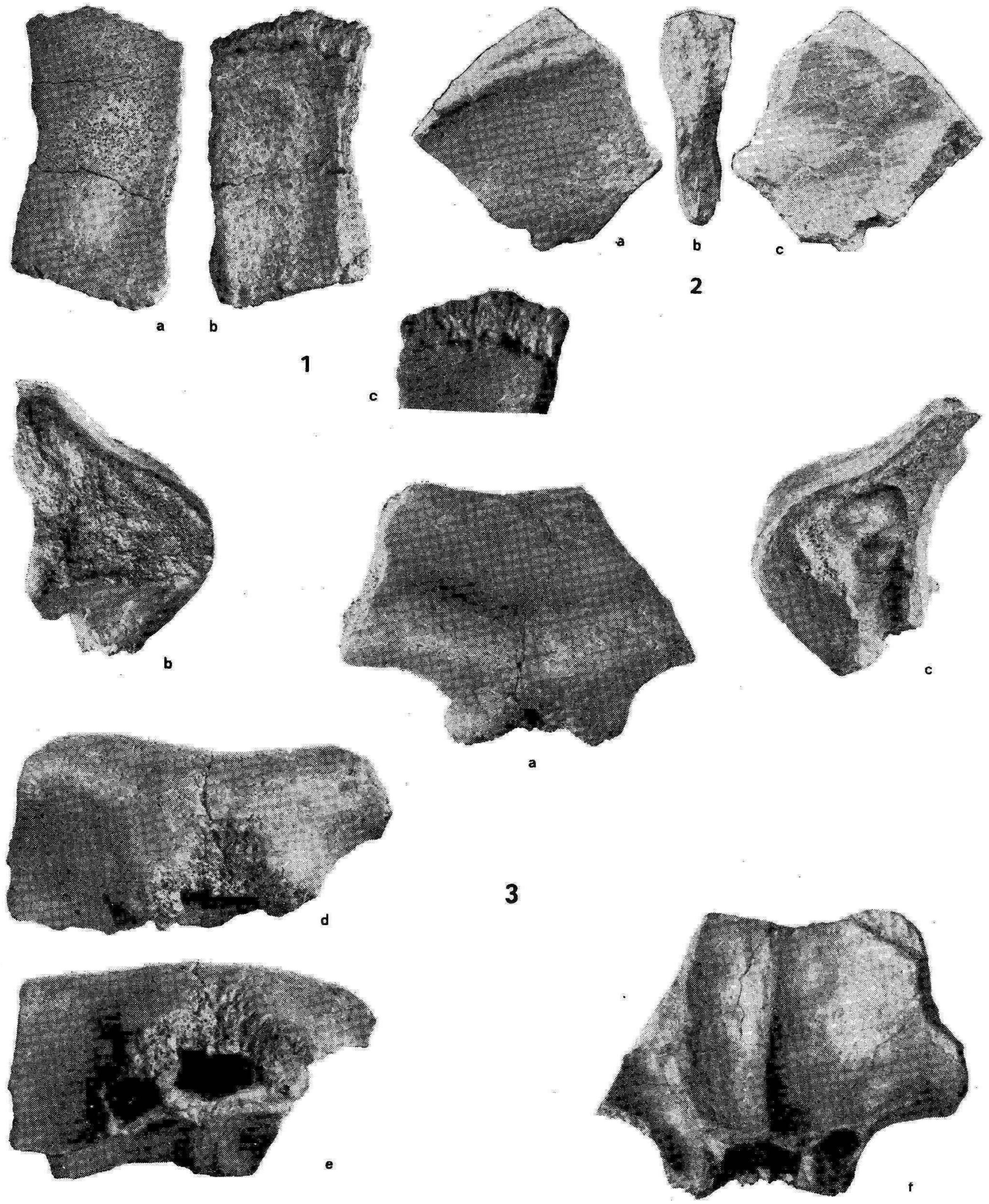


PLATE 2. *Bilzingsleben.* 1 *Upper fragment of Os frontale* (*B2*). a *view from the exterior,* b *from the interior.* — 2 *Lateral fragment of Os frontale* (*B3*). a *view from the exterior,* b *from lateral,* c *from the interior.* — 3 *Middle fragment of Os frontale* (*B1*). a *frontal view,* b *view from the right,* c *from the left,* d, e *from the bottom,* f *from the interior.* — 1 : 1.

gins are still recognizable. The orbital roof on the right is also preserved in a small part. The size of the fragment of Os frontale is 53×68 mm.

Bilzingsleben B2: The second fragment of Os frontale is 50×30 mm large. A piece of Sutura coronalis and the basal part of Crista frontalis being preserved it can be located parasagittally to the left side of Bregma.

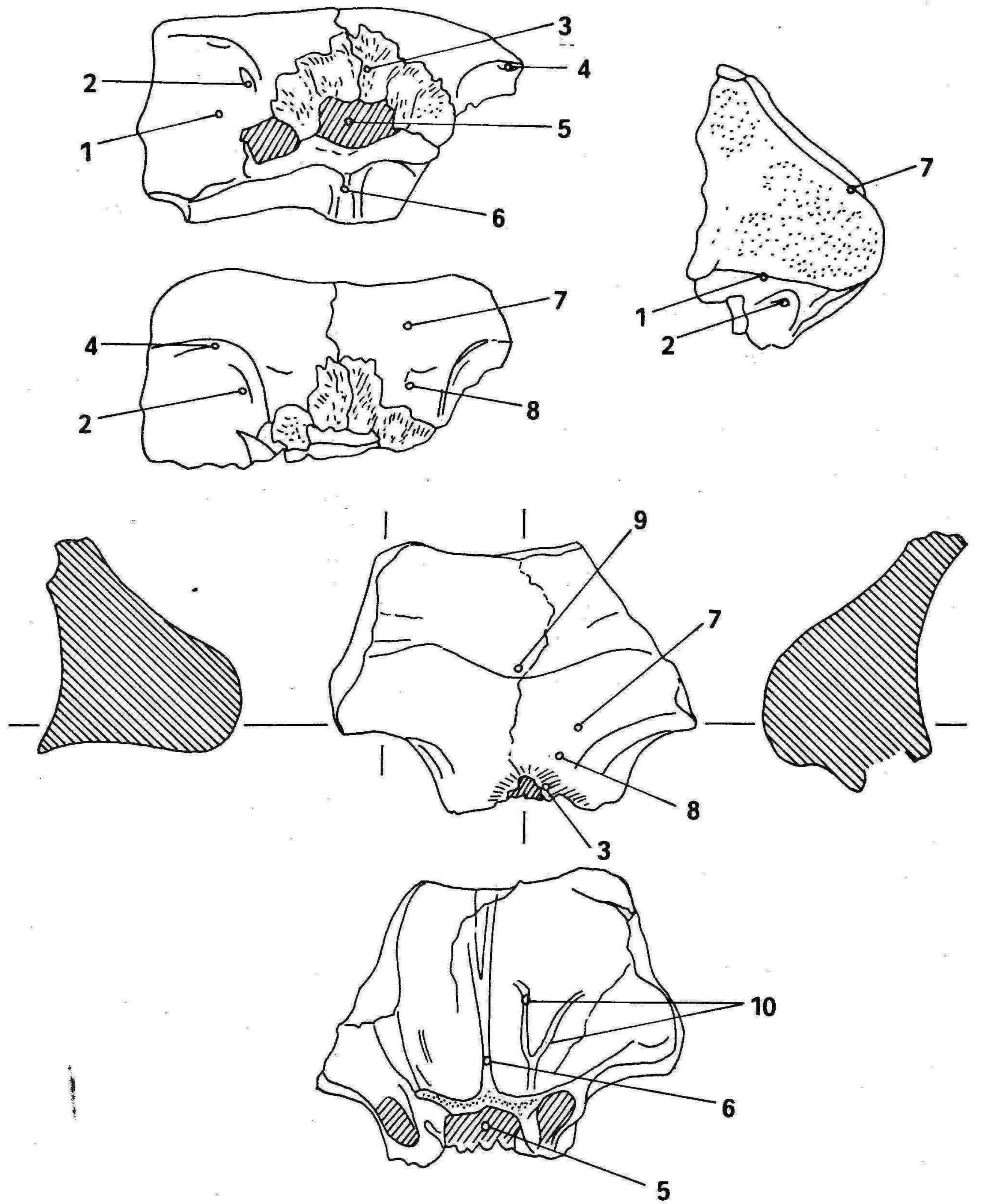


FIGURE 14. *Bilzingsleben. Os frontale* (*B1*). 1 *Facies orbitalis,* 2 *Fovea trochlearis,* 3 *Sutura nasofrontalis,* 4 *Incisura frontalis media,* 5 *Apertura sinuum frontalium,* 6 *Crista frontalis,* 7 *Torus supraorbitalis,* 8 *Pars nasalis ossis frontalis,* 9 *Depressio glabellae,* 10 *Arteria.* — 1 : 1.

Bilzingsleben B3: It is an irregularly quadrangular fragment of Os frontale. It is 35×34 mm large and derived from Planum temporale of the left part of Os frontale. Its thickness is 6 mm at an average, in the region of the preserved Linea temporalis it is 10 mm decreasing in the direction of Sutura fronto-sphenoidea until 3 mm.

Description of Os frontale (B1, B2 and B3)

The middle fragment of Os frontale and the fragment of the upper part of the Os frontale from Bilzingsleben hominid bear the following characteristics:

Pars nasalis frontalis (*fig. 14*)

Pars nasalis ossis frontalis demonstrates quite a complex of characteristics. It is very large and has a powerful nasal bridge. The frontal interorbital width (mf—mf) is 34 mm. The naso-frontal suture forms a trapezoid on the nasal bridge with a proximal side of 9,5 mm and a basal side of 21 mm represented by the width of Ossa nasalia. Its height is 13 mm. Spina frontalis is broken off. Aperturae sinuum frontalium are opened by a Foramen of 12×8 mm.

Sinus frontales

The frontal cavities of the Bilzingsleben find are only developed in the mass of the Torus supraorbitalis (Vlček 1980, plate 39). They are, on the whole, cauliflower-like in form. The basal part of the frontal cavities is deeply introduced into Pars nasalis ossis frontalis and completely pneumatized. However, the sinus roofs do not transgress the region of Torus supraorbitalis and Depressio glabellae of Os frontale. When x-rayed they show two large chambers not further divided by septs, but chambered by prominent sections on the posterior and on the upper walls.

The cross-diameter is 47 mm, the height is 30 mm and the depth 17 mm. From the comparison of the Bilzingsleben hominid with the Homo erectus and with a series of Europeen Neandertal men it can be concluded that the frontal cavities of the Bilzingsleben hominid as far as its height and its width are concerned is in the upper limit of the variation of Homo erectus and on the lower limit of the variation of the Neandertals (*table 7*).

Margo supraorbitalis (*fig. 14*)

On both sides of Pars nasalis there are small Incisurae frontales mediales their frontal wall being limited by a small edge. This edge passes laterally into the lower rim of Torus supraorbitalis and forms Margo supraorbitalis at the same time, cutting off the mass of Torus supraorbitalis from Facies orbitalis ossis frontalis.

Torus supraorbitalis (*fig. 14*)

The most striking characteristic of the Os frontale fragment of the Bilzingsleben find is Torus supraorbitalis forming a powerful not interrupted feature in the glabellar region in Norma verticalis and showing a flat depression in Norma frontalis (Depressio glabellae). This Depressio glabellae is wide and smooth so that we can find a current transition proximally to the surface of Squama ossis frontalis and distally to the region of Glabella. Therefore, it seems that no Sulcus supraorbitalis is developed. The size of the Torus supraorbitalis is distinctly recognizable on the 25 mm long distance between Nasion and Crista frontalis. The 28 mm distance of Glabella and Crista frontalis shows it clearly, too. The thickness of Torus supraorbitalis is characteristic of Homo erectus: Measured in the plane of Incisura frontalis lateralis it is 32 mm and measured in the median-sagittal plane it is 25 mm. The height of Torus supraorbitalis is also quite remarkable reaching 21 mm in Nasion and in the plane of Incisura frontalis medialis. The surface of Torus supraorbitalis is quite smooth.

TABLE 7. *The measures of the frontal cavity of Homo erectus and of Homo sapiens (in mm)*

	Width	Height	Depth	Author
Pithecanthropus I	26—30	—	24	Dubois, Weinert
Sinanthropus (n = 4)	8—24.5	—	4—15	Weidenreich
Homo soloensis (n = 3)	19—25	max. 17	14—18	Weidenreich
Bilzingsleben	47 27R 20L	30	17	Vlček
Neandertal	65 35R 30L	25	18	Vlček
	— 37 30	—	—	Schwalbe
La Chapelle	73 35 38	31	24	Vlček
La Quina ad.	68 30 38	34	28	Vlček
	40 — —	32	16	H. Martin
La Ferrassie	91 43 48	42	29	Vlček
Circeo I	64 35 29	35	18—20	Sergi, Vlček
Šala	52 25 27	29	18	Vlček
Kafzeh VI	61 32 29	25	25	Vlček
Gibraltar ad.	54 31 23	27	?	Vlček
Krapina C	56 — —	40	—	Vlček
	— — 29	—	12	Hofmann
Krapina E	71 36 35	33	—	Vlček
Ehringsdorf H	80 — —	42	18	Vlček
Saccopastore I	(65) — —	(29)	12	Sergi, Vlček
Saccopastore II	— — —	—	16	Sergi
Modern man	20—37.5	28.8—40	16—20	Brege, Mihalkovics, R. Martin
♂	—	25.8	9.9	Borovansky
♀	—	21.5	7.7	Borovansky

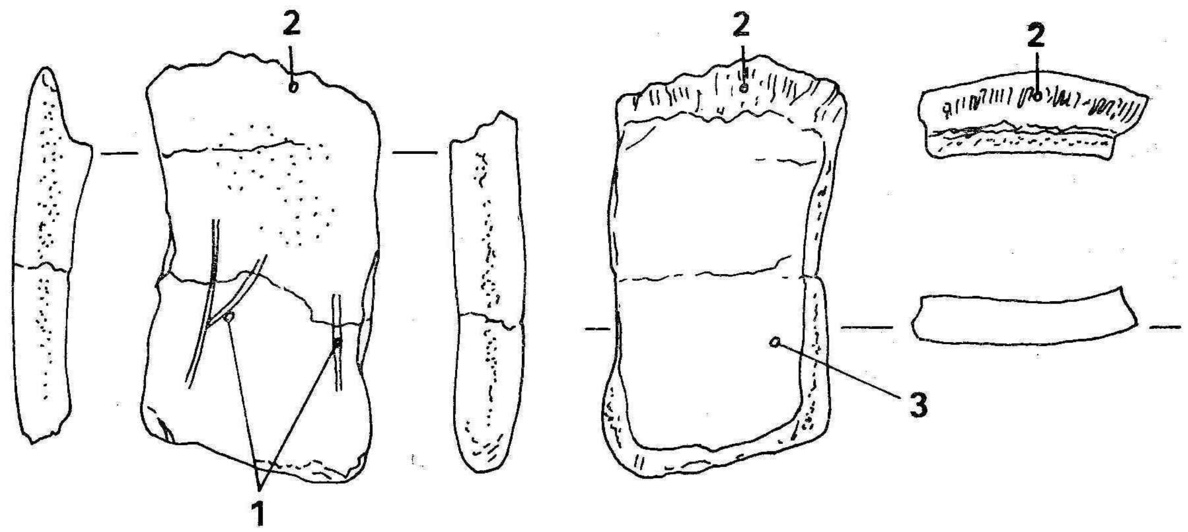


FIGURE 15. *Bilzingsleben. Fragment of Squama ossis frontalis (B2). 1 Arteria, 2 Sutura coronalis, 3 — 1 : 1.*

Squama ossis frontalis (*figs. 14—16*)

At piece B1 (*fig. 14*) only a smaller part of Squama ossis frontalis is preserved. Measured from Glabella as far as the upper fracture rim it is 37 mm long. The surface of this part is smooth and is extremely oblique above Torus supraorbitalis. Squama is not very thick: 8 mm in Metopion and only 6 mm right of Crista frontalis. Sutura coronalis from the second fragment (B2) (*fig. 15*) is preserved with a length of 30 mm. The serrated surface of the suture is obliquely set. There are slight vessel impressions on the surface of the fragment. The Lamina interna surface has flat and smooth impressions (Impressiones gyrorum). On the left fracture edge of the fragment the left rim of Crista frontalis appears. The maximum thickness of the fragment is 10 mm, the minimum thickness is 6,3 mm and at Sutura coronalis it is only 9 mm, (*fig. 16*).

Facies cerebralis (*fig. 14*)

Facies cerebralis is divided into two halves by Crista frontalis. The sharper-edged Crista frontalis is indistinctly developed frontally and backward above, after a length of 18 mm, it is forked. It is slightly convex to the left. The course of this Crista frontalis is preserved at a length of 37 mm. On either side of the Crista there are shallow impressions—Impressiones gyrorum and Juga cerebralia—and slight vessel impressions—Sulci arteriosi.

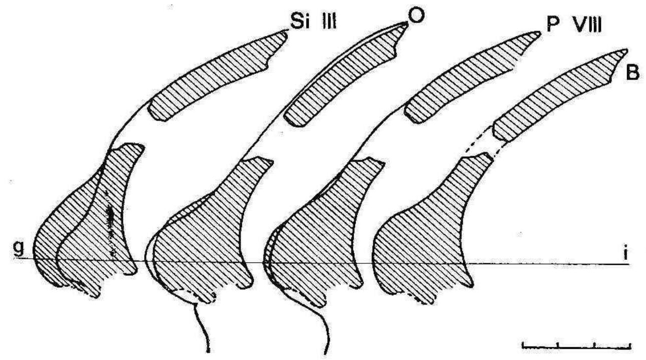


FIGURE 16. *Bilzingsleben. Frontal fragments (B1, B2) compared with Sinanthropus III* (Si III), *Olduvai 9* (O) *and Pithecanthropus VIII* (P VIII). *Reconstruction Bilzingsleben* (B).

The thickness of Os frontale

The thickness of Squama ossis frontalis can easily be measured on the second fragment of Os frontale. At the greater fragment (B1) Squama is only preserved as a small piece (*table 8*).

TABLE 8. *The thickness of Os frontale (B1 and B2)*

1. Squama ossis frontalis in Bregma (B2)	9,0 mm
2. S. o. f. in Metopion (B2)	7,0 mm
3. at Tuber frontale (B2)*	7,6 mm
4. in Sulcus supraorbitalis (B1)*	6,0 mm
5. above Depressio glabellae (B1)	8,0 mm

* *parasagittally in the plane of Incisura frontalis lateralis.*

Dates of Os frontale

As table 9 shows only a few metrical dates can be obtained from the two preserved fragments of Os frontale from the Bilzingsleben hominid.

Linea temporalis

On fragment B3 a part of the double Linea temporalis is preserved (*plate 2,2*). It can easily be compared with the same portion of the skull from Olduvai-Hominid 9.

3.2.3. *Upper right molar (Bilzingsleben C1)*

The state of preservation

The molar consists of two fragments with the whole crown and a smaller part of the tooth being preserved and the roots missing completely. The tooth enamel is white and at the abraded parts it is yellowish. The dentine shining through at the cusps of the tooth is of ochrous colour.

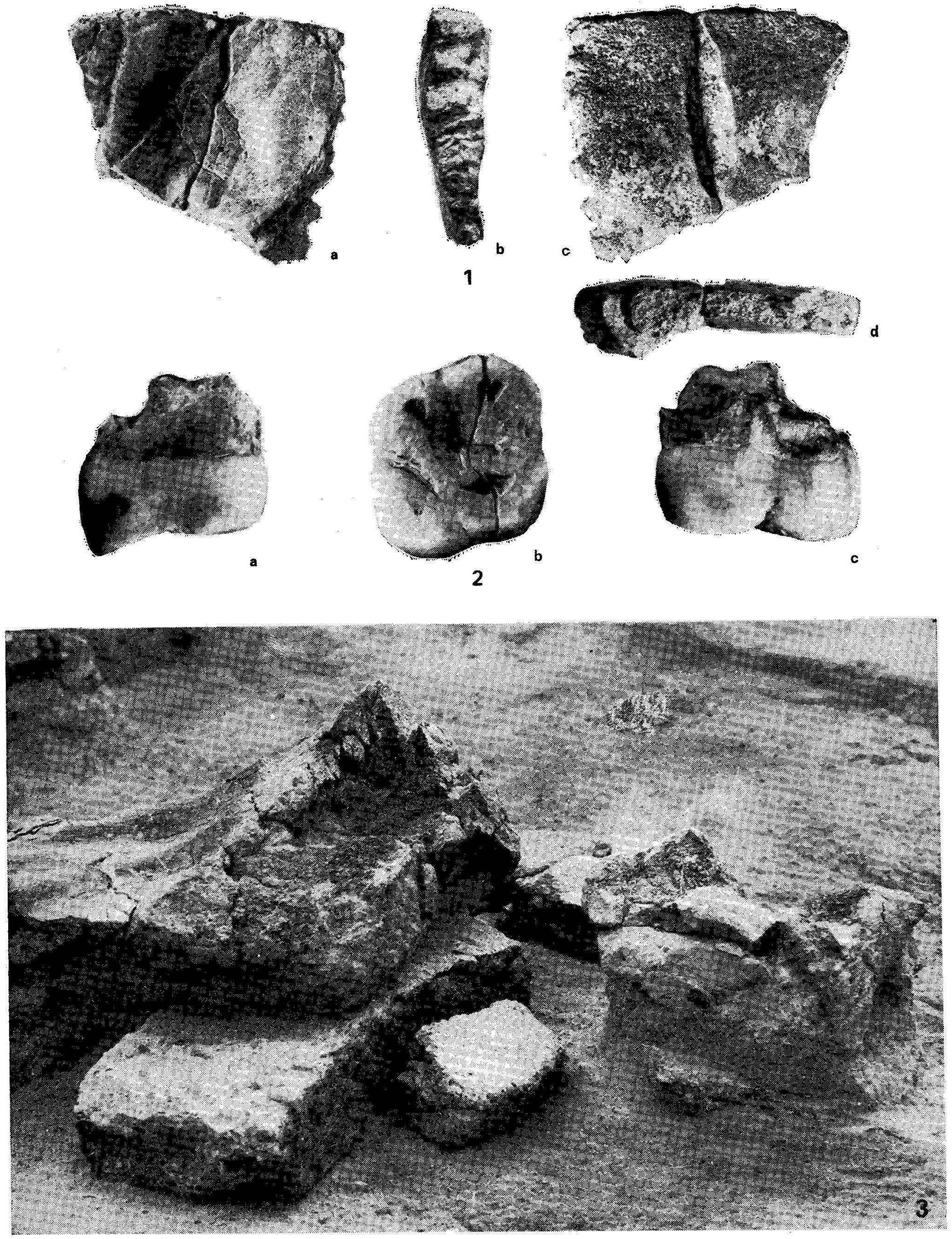


PLATE 3. *Bilzingsleben.* 1 *Fragment of the right Os parietale (D1).* a *view from the interior,* b *Lambda suture,* c *from the exterior,* d *fracture surface.* — 2 *Molar* M^{1-2} *dx (C1).* — 3 *Working-place in situ. A pelvis fragment from an elephant lying on an anvil of limestone. In front of it, there are detached pieces and a chopper fractured into three fragments.*

Description of the tooth (*fig. 17, plate 3,2*)

The molar is situated in the right upper jaw and can be determined as M^1 or M^2 dx because of the formation of two Facies contactus on Facies mesialis and F. distalis.

The abrasion of the crown (*plate 3,2*)

The crown of the tooth is irregularly abraded. The buccal cusps are more abraded than the lingual ones. The whole Facies masticatoria is covered with various abrasion surfaces. Fissura mesialis in front of Fovea anterior is completely abraded. Fissura obliqua, too, is lingually remarkably shallow. Best preserved is Fissura buccalis media. All four cusps of the tooth are also much abraded so that the dentine goes through at the triangular abrasion surfaces.

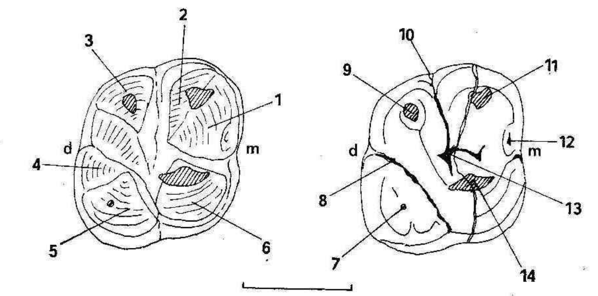


FIGURE 17. *Bilzingsleben. Molar* M^{1-2dx} *(C1). Occlusal face.* 1—6 *Abrasion faces,* 7 *Hypoconus,* 8 *Fissura obliqua,* 9 *Metaconus,* 10 *Fissura buccalis media,* 11 *Paraconus,* 12 *Fovea anterior,* 13 *Fovea centralis,* 14 *Protoconus.*

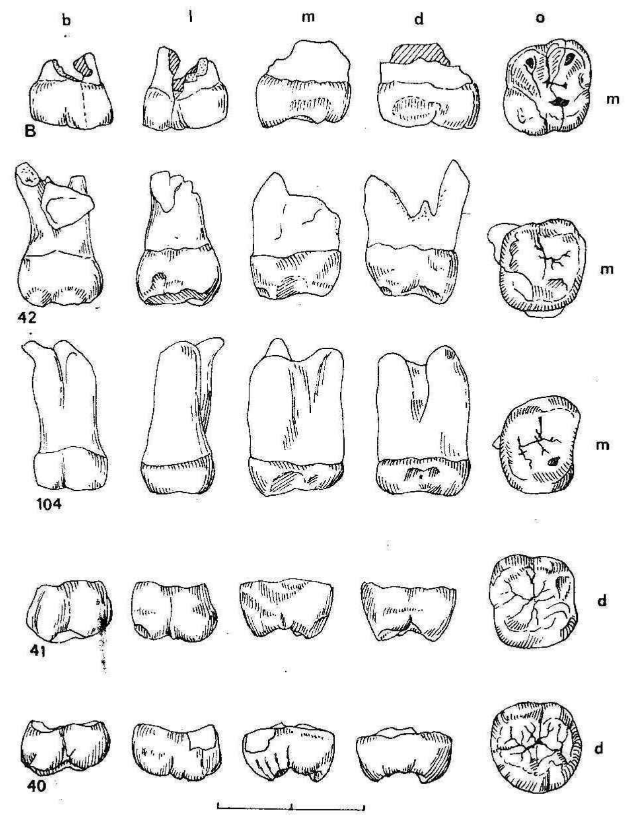


FIGURE 18. *Comparison of* M^{1-2dx} *from Bilzingsleben* (B) *with* M^2 *of Sinanthropus Nr. 42, 104, 41 und 40.*

The tooth cusps

The whole form of the crown in Norma verticalis is rhombic. All four cusps are well developed, but they are so abraded that they cannot be measured. The mesiolingual cusp of Trigon (Protoconus) is the most powerful. There is no distinct boundary against Paraconus. Fissura obliqua is quite well visible against Talon with Hypoconus. The mesiobuccal cusp (Paraconus), which is the most prominent cusp, is distinctly limited from Metaconus by Fissura buccalis media. This Fissura is directly connected with Fovea centralis. Metaconus abraded in a pyramid form has, in the middle of the cusp, a triangular surface of the dentine, which shows through. Contrasting with it, Hypoconus is abraded spheroidally.

The system of enamel folds

Unfortunately, the remarkable tooth abrasion has partially obliterated the configuration details on Facies masticatoria. From the remaining parts one gets a good idea of the system of the main and of the side folds of the tooth relief. Compared with the morphology of the crown relief of the Sinanthroups teeth as well as of the Neandertal and modern forms the molar from Bilzingsleben corresponds quite well to the Sinanthropus finds (*fig. 18*).

Cavum dentis

X-rayed Cavum dentis showed that it is wide in the crown and in the region of the tooth neck in all

TABLE 9. *The dimensions of Os frontale (in mm)*

1 Distance between Nasion—Crista frontalis	25
2 Thickness of Torus supraorbitalis in Glabella	28
3 Thickness of T. s. in the plane of Incis. f. med.	32
4 Height of T. s. in the mediansagittal plane	21
5 Height of T. s. in the plane of Incis. f. med.	21
6 Mediansagittal arc (n—g)	13
7 Mediansagittal frontal arc (26 Martin) (n—b)	— (120)
8 Mediansagittal glabellar arc (26/1) (n—sg)	42
9 Mediansagittal cerebral arc (26/2) (sg—b)	— (78)
10 Mediansagittal chord (n—g)	12
11 Mediansagittal frontal chord (N—b) (29)	—
12 Mediansagittal chord of Pars glabellaris (n—sg) (28/1)	35
13 Mediansagittal chord of Pars cerebralis (sg—b) (29/2)	— (77)
14 Glabella-Bregma angle (32/2)	—
15 Frontal inclination angle of Pars glabellaris (n—sg : n—i) (32/3)	—
16 Frontal inclination angle of Pars cerebralis (sg—b : n—i) (32/4)	—
17 Posterior interorbital width (1a—1a) (49)	—
18 Interorbital width (d—d) (49a)	37?
19 Anterior interorbital width (mf—mf) (50)	34
20 Upper width of Nasalia (57/2)	15
21 Length of the nasal process of Os frontale (n—so) (58)	6
22 Length of Sutura nasofrontalis dex.	10
23 Length of Sutura nasofrontalis sin.	10

three projections (Vlček 1980, plate 43). Unfortunately, the further course of the pulpar cave in the lower parts of the roots cannot be traced.

Tooth measurement

Metrically, the molar from Bilzingsleben (*table* 10) was compared with the Homo erectus material (Pithecanthropus IV, Sinanthropus, Lantien, Rabat, Ternifine, *table 11—12*) with the molar teeth of Homo sapiens, e.g. fossil finds from Předmostí (*table 13*) as well as with different series of modern man (*table 14*). Thereby, a certain correspondance arises with the variation width of Homo erectus M^1.

TABLE 10. *Bilzingsleben, dimensions of* M^{1-2dx}

Mesio-distal length of crown	12.0 mm
Bucco-lingual breadth of crown	13.0 mm
Buccal height of crown	6.8 mm
Lingual height of crown	6.0 mm
Module of crown (MD + BL : 2)	12.5 mm
Area of crown (MD × BL)	156.0

Summary of the most significant features

The M^1 dx from Bilzingsleben shows the following features: 1. It has four cusps all of them being rather strongly developed. 2. The system of enamel folds is visible despite the remarkable abrasion of the crown and corresponds well to the Sinanthropus teeth. 3. Cavum dentis is large.

3.2.4. *Fragment of the right Os parietale* (*fig. 19 and plate 3,1*)

This fragment consists of two parts and is 55×47 mm large. It is rectangular and belongs to the posterior and lower part of Os parietale dx. Angulus mastoideus, Sutura parietomastoidea in a length of 11 mm and the lower half of Margo occipitalis with Sutura lambdoidea (L3) in a length of 47 mm are preserved. At Facies parietalis the posterior part of Linea temporalis fascialis with Planum temporale are visible. Sutura lambdoidea (L3) is formed in a simply errated way. The maximum thickness of the fragment is at Angulus mastoideus (14 mm), the minimum thickness is between 7 and 7,5 mm. At Linea temporalis fascialis the thickness is 9 mm. Sutura lambdoidea is 7—14 mm wide.

On Facies cerebralis there are Sulci belonging to the two branches of Ramus posterior of Arteria meningica media. At the inner surface of the fragment a part of Sulcus transversus is visible at Angulus mastoideus. Here, Impressiones gyrorun are smooth and fine.

TABLE 11. *The size of* M^{1-2dx} *from Bilzingsleben in comparison with Homo erectus and Australopithecus* (*Tobias*) *in mm*

	Zi L+R	P	A	SaIV n=1—2	Ch n=6—9	La n=1	R	T	H.e.m n=9—11	B
M^1										
1 Mesio-distal crown length	15.2	13.8	12.6	12.2	10.9	12.8	—	12.0	11.6	12.0
2 Bucco-lingual crown breadth	17.7	14.5	13.8	13.7	12.5	13.7	—	14.4	13.1	13.0
3 Crown module (MD + BL : 2)	16.45	14.1	13.2	12.9	11.7	13.25	—	13.2	12.25	12.5
4 Crown area (MD×BL)	269.0	200.1	173.4	166.3	136.5	175.4	—	172.8	150.2	156.0
M^2										
1	17.2	14.5	13.8	13.6	10.9	—	11.5	—	11.3	12.0
2	21.0	15.9	15.4	15.2	12.7	—	13.0	—	13.0	13.0
3	19.1	15.2	14.6	14.4	11.8	—	12.25	—	12.15	12.5
4	361.2	230.9	212.6	206.7	138.4	—	149.5	—	147.4	156.0

Zi *Zinjanthropus*, P *Paranthropus*, A *Australopithecus*, SaIV *Sangiran IV*, Ch *Choukoutien*, L *Lantien*, R *Rabat*, T *Ternifine*, H.e.m. *Homo erectus mean value*, B *Bilzingsleben*.

TABLE 12. *The size of* M^{1-2dx} *from Bilzingsleben in comparison with Sinanthropus* (*Weidenreich*) *in mm*

M^1	No. 31 ♂	No. 33 ♂	No. 94 ♀	No. 32 ♀	No. 95 ♀	No. 140 ♀	No. 144	m	B
1	13.1	12.1	10.0	11.3	10.2	11.1	10.6	11.2	12.0
2	—	13.4	11.7	11.7	12.3	13.7	12.4	12.5	13.0
3	—	12.75	10.85	11.5	11.25	12.4	11.5	10.3	12.5
4	—	162.1	117.0	132.2	125.7	152.0	131.4	136.25	156.0
M^2	No. 39 ♀	No. 40 ♀	No. 41 ♀	No. 42 ♀	No. 104 ♀	No. 105 ♀	No. 145	m	B
1	10.5	12.2	11.1	11.4	10.3	10.2	10.6	10.9	12.0
2	12.3	12.2	13.2	12.4	12.8	12.8	13.4	12.1	13.0
3	11.4	12.2	12.15	11.9	11.55	11.5	12.0	11.8	12.5
4	129.15	147.6	146.5	141.4	131.8	130.6	142.0	138.4	156.0

B *Bilzingsleben* (*Vlček*), *1—4 as in Table 11.*

TABLE 13. *The size of* M^{1-2dx} *from Bilzingsleben in comparison with late pleistocene finds from ČSSR (Matiegka) in mm*

	Předmostí I ♂ R	I ♂ L	III ♂ R	III ♂ L	IX ♂ R	IX ♂ L	XIV ♂ R	XIV ♂ L	IV ♀ R	IV ♀ L	V ♀ R	V ♀ L	X ♀ R	X ♀ L	II R	II L	VII R	VII L	Brno III R	Brno III L	Pavlov I* R	Pavlov I* L	Dolní Věstonice III** R	Dolní Věstonice III** L	Zlatý Kůň* R	Bilzingsleben* R
M^1																										
1 Mesio-distal crown length	10.1	11.0	11.0	11.5	12.0	12.0	12.0	11.5	10.0	9.0	11.0	11.0	10.2	10.0	11.3	11.0	11.5	10.5	9.4	10.4	9.5	9.6	9.9	10.0	10.0	12.0
2 Bucco-lingual crown breadth	12.0	11.3	12.6	13.3	13.0	13.0	13.0	12.3	11.4	11.4	12.0	12.0	11.5	11.5	12.4	12.2	12.0	12.4	11.2	11.4	11.5	11.2	11.5	11.4	12.0	13.0
3 Modul of crown (MD + BL : 2)	11.0	11.15	11.8	12.4	12.5	12.5	12.5	11.6	10.7	10.5	11.5	11.5	10.85	10.75	11.85	11.6	11.75	11.45	10.3	10.9	10.5	10.4	10.7	10.7	11.0	12.5
4 Area of crown (MD×BL)	121.2	124.3	138.6	152.9	156.0	156.0	156.0	141.45	114.0	109.0	132.0	132.0	117.3	115.0	140.1	134.2	138.0	130.2	105.2	118.6	109.25	107.5	138.5	114.0	120.0	156.0
M^2																										
1 Mesio-distal crown length	9.3	9.3	11.0	11.4	11.8	11.8	6.6	11.0	10.0	9.5	10.0	10.0	10.5	10.0	—	—	10.5	11.0	9.0	9.6	9.0	11.0	9.8	9.8	10.0	12.0
2 Bucco-lingual crown breadth	11.5	11.6	13.2	13.2	14.0	13.0	7.0	13.7	11.0	11.2	11.8	12.0	11.7	11.7	—	—	12.0	12.2	10.9	11.4	12.0	12.2	11.4	11.5	11.6	13.0
3 Modul of crown (MD + BL : 2)	10.4	10.45	12.1	12.3	12.9	12.4	6.8	12.35	10.5	10.35	10.9	11.0	11.1	10.85	—	—	11.25	11.6	9.9	10.5	10.5	11.6	10.6	10.65	10.8	12.5
4 Area of crown (MD×BL)	106.95	107.8	145.2	150.5	165.2	153.4	46.2	150.7	110.0	106.4	118.0	120.0	122.85	117.0	—	—	126.0	134.4	98.1	109.4	108.0	134.2	109.4	112.7	116.0	156.0

* Vlček ** Jelínek.

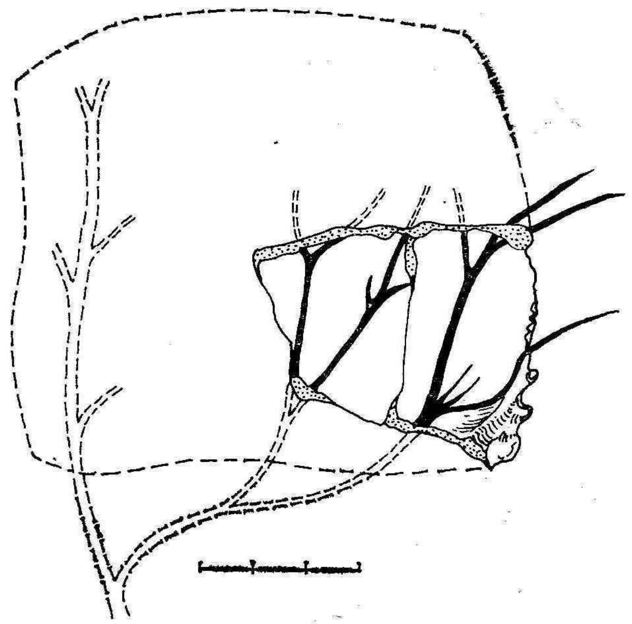


FIGURE 19. *Bilzingsleben. Fragment of the right Os parietale (D1). Endocranial view, supplemented. The ramification pattern.*

The fragment of the right Parietale close to Squama ossis occipitalis (Bilzingsleben A1) matches into L3. The serration of the branches of Sutura lambdoidea has a direct contact to Os occipitale. The ramification of the branches of Ramus posterior of Arteria meningica media from Facies cerebralis of the right Parietale continues gradually into Facies cerebralis ossis occipitalis (*fig. 19*). For this reason, it may be suggested that the fragment of Os occipitale A1 and A2 and the fragment of the right Parietale D1 belong to the same individual.

3.2.5. *Molar Bilzingsleben E1*

It was determined as a lower right molar (M_2 dx) and is described by E. Vlček in 1986.

3.2.6. *Molar Bilzingsleben E2*

It was determined as a lower left molar (M_1 sin) and is described by E. Vlček in 1986.

TABLE 14. *The size of M^{1-2dx} from Bilzingsleben in comparison with modern man (Tobias) in mm*

	Au	Es	Al	Ja	BN	Ho	Am	B
M[1]								
1	11.4	10.7	10.2	10.2	10.3	9.9	10.7	12.0
2	12.8	11.6	11.3	11.3	11.0	10.6	11.8	13.0
3	12.1	11.2	10.7	10.7	10.7	10.3	11.3	12.5
4	145.9	124.1	116.1	115.3	113.3	104.9	126.3	156.0
M[2]								
1	10.9	10.2	9.9	9.7	10.0	9.7	9.2	12.0
2	13.1	11.5	11.3	11.4	11.5	10.6	11.5	13.0
3	12.0	10.9	10.6	10.5	10.8	10.2	10.4	12.5
4	142.8	117.3	112.0	110.6	115.0	102.8	105.8	156.0

Au *Australians* Es *Eskimo-Greenland*, Al *Aleuts*, Ja *Japanese* BN *Bantu-Negroids*, Ho *Hottentots*, Am *American* (*white*), B *Bilzingsleben* (*Vlček*) *1—4: Table 11.*

3.3. *The phylogenetical position of the Bilzingsleben hominid*

In order to determine the phylogenetical position of the Bilzingsleben cranial remains it is necessary to compare them with the remains of the fossil man already known. Such finds were chosen which, according to the present general view, show a continuous line of the evolutionary forms of man. They are the finds of Homo erectus from Java, China, East and South Africa. European finds from Swanscombe, Steinheim, Vertesszöllös, Arago-Tautavel and Ehringsdorf. They are followed by European Neandertal men and finally by the fossil and modern forms of Homo sapiens.

Os occipitale from Bilzingsleben has a distinctly strong angled occiput. Planum occipitale is formed in a characteristic way. Planum occipitale and Planum nuchae have a curvature angle of 108°. The points Inion and Opisthocranion coincide in the median sagittal plane (*figs. 20—21*).

Planum nuchae is markedly flattened and it bears a distinct muscle relief. Another conspicuous feature of the find is the thickness of Os occipitale. The distance of Inion to Crista occipitalis interna is 17 mm. On the cast of the endocranium of Os occipitale there are distinctly extended occipital poles.

In comparing the Bilzingsleben find in the characteristic mediansagittal section with Pithecanthropus II, IV, VIII and with Olduvai-Hominid 9 we get the morphologically closest resemblence with Sinanthropus III, Pithecanthropus VIII and Olduvai 9. In comparing the Bilzingsleben find with the series of Homo soloensis (I, V, VI, X, XI) and with the cranium from Broken-Hill we find, however, remarkable differences in the morphology of Torus occipitalis, in the bone thickness on Inion and in the remarkable thickness of the lower part of Squama ossis frontalis (*figs. 22—23, table 15*).

Most interesting was the comparison of the Bilzingsleben hominid with the finds of the European Middle Pleistocene. It revealed that only the find from Vertesszöllös, an Os occipitale with a curved occiput and with the coincidence of Inion and Opisthocranium at the lower edge of Torus occipitalis has certain similarities with the find from Bilzingsleben. The finds from Swanscombe, Steinheim, Ehringsdorf, however, show basic differences distinguishing them clearly from the Bilzingsleben hominid. All these finds do not show any Torus occipitalis, the maximum length of the cranium does not coincide with Inion and the whole occiput is curvo-occipital.

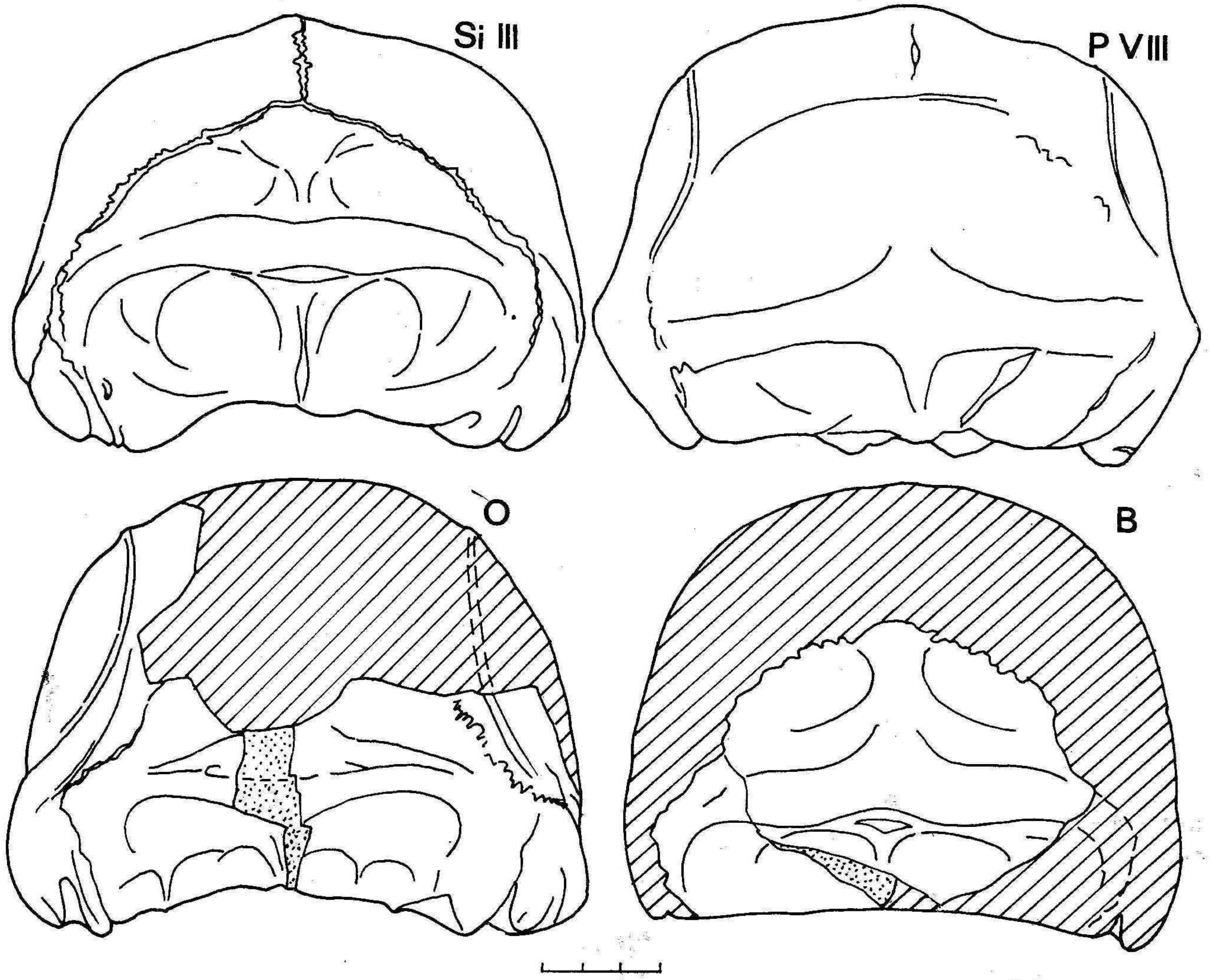


FIGURE 20. *Comparison of Bilzingsleben find* (B) *in Norma occipitalis with Homo erectus-forms.* Si III *Sinanthropus III*, P VIII *Pithecanthropus* VIII, O *Olduvai 9.*

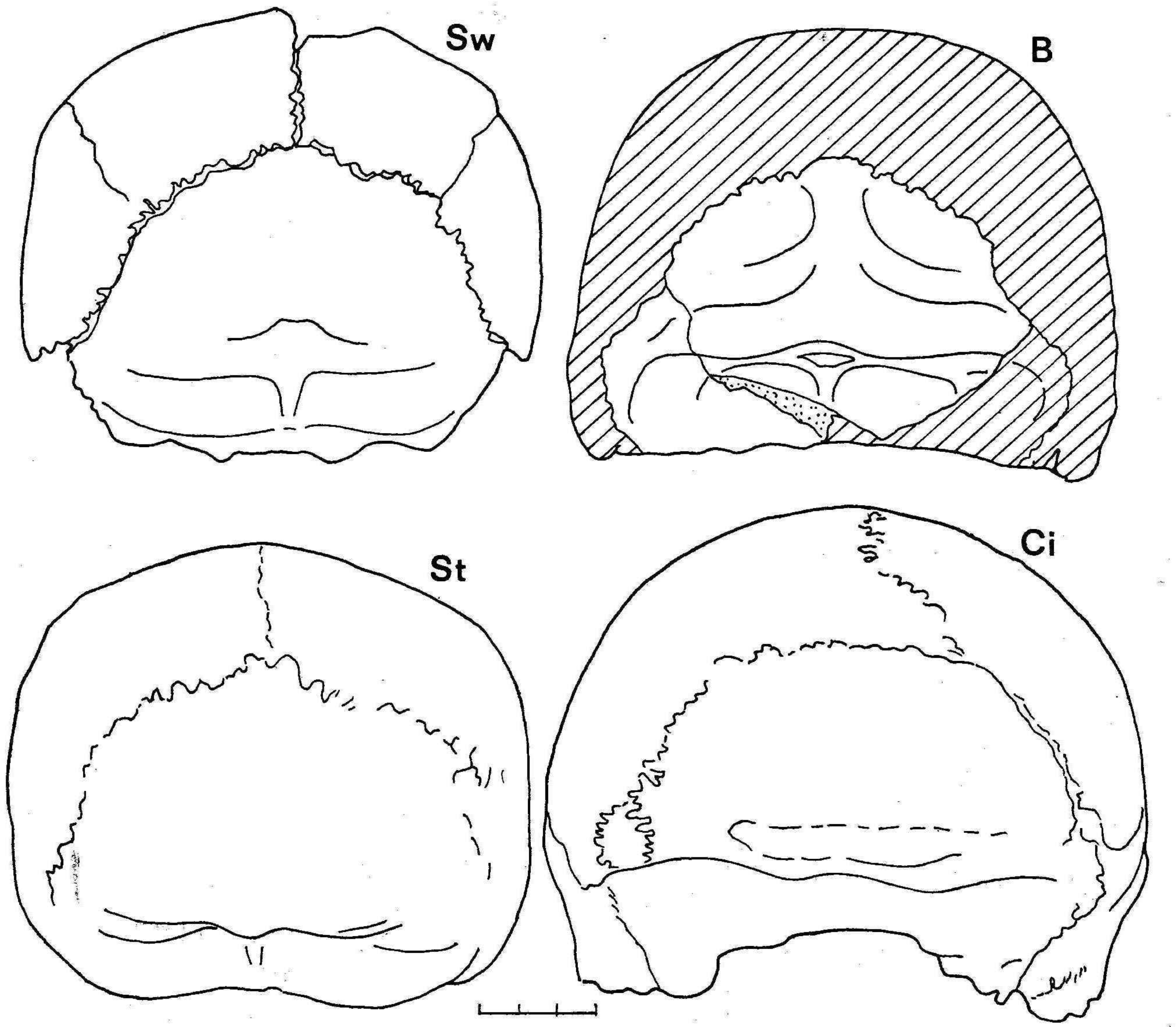


FIGURE 21. *Comparison of Bilzingsleben finds* (B) *in Norma occipitalis with Homo sapiens-forms.* Sw *Swanscombe*, St *Steinheim*, Ci *Circeo I.*

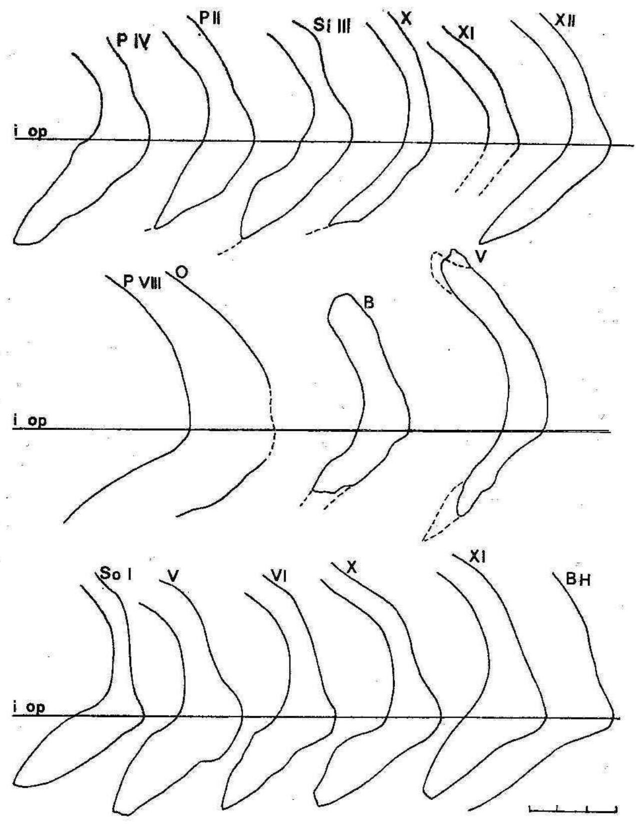


FIGURE 22. *Comparison of mediansagittal section of Os occipitale from Bilzingsleben* (B) *with other fossil finds.* P II, IV *and* VIII *Pithecanthropus*, Si III—XII *Sinanthropus*, O *Olduvai* 9, V *Vertes-szöllös*, SO I-XI *Solo*, BH *Broken-Hill.*

The bone thickness of the above-mentioned finds (*table 16*) is equally lower, and the configuration of the occipital parts on the endocranium cast points to Homo sapiens forms (*fig. 13*). Quite similar results were evident from the comparison of the Bilzingsleben

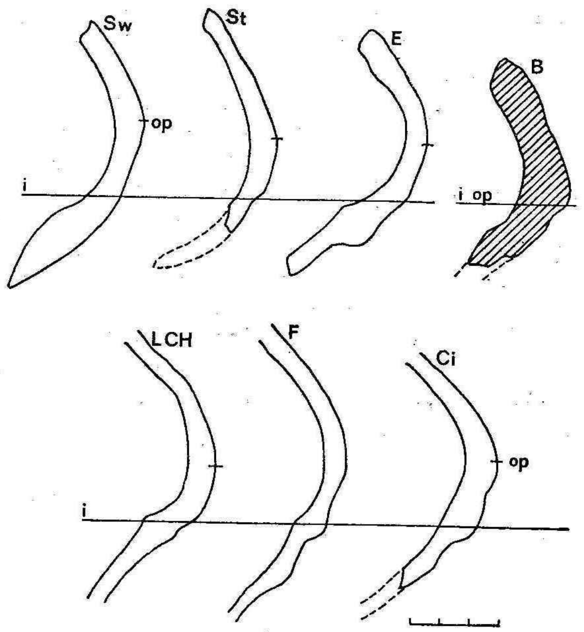


FIGURE 23. *Comparison of mediansagittal section of Os occipitale from Bilzingsleben* (B) *with other fossil finds.* Sw *Swanscombe*, St *Steinheim*, E *Ehringsdorf*, LCH *La Chapelle*, F *La Ferrassie*, Ci *Circeo I.*

TABLE 15. *The thickness of Os occipitale of Bilzingsleben in comparison with Homo erectus forms (after Weidenreich) in mm*

	B	P I	P II	P III	P IV	Pm	S II	S III	S V	S VIII	S X	S XI	S XII	Sm	V
1 Planum occipitale	11.0	—	13.0	7.0	13.5	13.5	(10.7)	10.0	(7.0)	5.0	10.0	9.0	9.0	9 2	8.0
2 Torus occipitalis (i = op)	17.0	15.0	20.4	—	21.5	19.0	—	20.4	(12.3)	7.1	15.0	12.0	15.0	17.0	15.0
3 Fossa cerebelli	5.0	—	5.0	—	5.0	5.0	—	6.8	4.5	3.8	(5.0)	2.8	2.5	4.3	3.5

B *Bilzingsleben* (*Vlček*), P I — P IV *Pithecanthropus*, Pm *Pithecanthropus mean value*, S II — S XII *Sinanthropus*, Sm *Sinanthropus mean value*, (P/S *Weinert*), V *Vertesszöllös* (*Vlček*).

TABLE 16. *The thickness of Os occipitale of Bilzingsleben man in comparison with the other fossil finds in mm*

	B	S I	S II	F	CH	Sw	St	Fo	E	Australians n = 16	Europeans ♂ + ♀ n = 400	Europeans ♂ n = 200
1 in Lambda region	11			7	6	10	6	8	7			
2 5 mm below Lambda	11	10	8			11	6.5		8	11.2	6.13	4.0—10.2
3 above Linea nuchae superior (planum occipitale)	11	7	7			6	7		5	6.41—6.33	3.62—3.51	2.2—6.7
4 in Inion	17					8.5	7		8			
5 below Linea nuchae inferior (Fossa cerebelli)	5	6.1	4			4	5		3	3.8—3.75	1.29—1.18	0.5—2.7
6 in Asterion	16			4		5	8					

B *Bilzingsleben* (*Vlček*), S I, S II Spy I *and* II (*Campbell*), F *La Ferassie* (*Vallois*), CH *La Chapelle* (*Vallois*), Sw *Swanscombe* (*Campbell*), St *Steinheim* (*Vlček*), Fo *Fontéchevade* II (*Vallois*), E *Ehringsdorf* (*Vlček*), *Australians and Europeans* (*Campbell*).

TABLE 17. *The dimensionsof Os occipitale of Bilzingsleben man in comparison with Homo erectus* (*Weidenreich*) *in mm*

	B[1]	P I	P II	P IV	P V	P VII	P VIII	S II	S III	S X	S XI	S XII	Sm	V[4]
1 12 27 Maximum occipital breadth (Ast—Ast)	—	92?	120?	130	121	—	—	103	117	111?	113	115	111.8	126.5
2 28 60 Mediansagittal occipital arc (l ∩ o)	—	(103)	102?	117	—	114	140	—	106?	—	118	118	114	134 (135)[2]
3 28/1 70 Mediansagittal upper squama arc (l ∩ i)	53	—	47	—	44	—	—	—	49	51	50	55	51.3	78 79[2]
4 28/2 72 Mediansagittal lower squama arc ((i ∩ o)	—	(57)	52	—	—	—	—	—	60?	—	67	60	62.3	56 56[2]
5 27/3 68 Lambda-Asterion arc (e ∩ ast)	R 100	—	R 98	—	—	—	—	R 90?	R 90	R 93	R 99?	R 92	92.8	R 95,5 L 89
6 31 61 Mediansagittal occipital (l — o) chord	—	(78)	75	78	—	83.1	88	—	80?	—	86	86	84	106 102[2] (100)[3]
7 31/1 71 Mediansagittal chord of upper Squama (l — i)	51	(43)	45	44	43	—	—	—	47	49	48	52.5	49.1	73,5 73[2]
8 31/2 73 Mediansagittal chord of lower Squama (i — o)	—	(53)	48	64	—	—	—	—	58?	—	63	57	59.3	56[3] (53)
9 69 Lambda-Asterion chord (l — ast)	R 86	—	R 85	—	—	—	—	R 83?	R 81	R 85	R 84?	R 87	84.0	
10 25 40 Curvature index of Os occipitale (31 : 28)	—	75.0	72.3	—	—	—	65.5	—	74.2	—	74.5	72.8	73.8	
11 26 41 Curvature index of upper Squama (31/1 : 28/1)	96.2	—	95.8	—	97.7	—	—	—	96.0	96.0	96.0	95.4	95.8	92,0
12 27 42 Curvature index of lower Squama (31/2 : 28/2)	—	—	92.3	—	—	—	—	—	96.0	—	94.0	95,0	95.0	
13 34/4 Occipital angle (l — i ∢ i — o)	108°	103°	—	—	—	—	—	—	106°	104°	105°	98°	103.2°	108,5° 103° 2
14 Distance Inion from Crista occip. int.	17.0		15,0	35,2	—	—	—	—	27.5	38.0	34,0	35.0	—	

B *Bilzingsleben*, P I—P VIII *Pithecanthropus*, S II—S XII Sinanthropus, Sm *Sinanthropus mean value*, V *Vertesszöllös.*
[1] *after Vlček*, [2] *correction*, [3] *after Tobias*, [4] *after Thoma.*

TABLE 18. *The dimensions of Os occipitale of Bilzingsleben in comparison with Homo soloensis and Broken-Hill* (*Weidenreich 1951*) *in mm*

	B	I	V	VI	IX	X	XI	m.	Broken-Hill
1	—	127	126	123	129	(125?)	(110?)	126,2	131
2	—	112	124	114	114	126?	120	118,3	118
	—	111*	128*	109*	115?*	114*	122*	116,8*	—
3	53	—	—	—	—	—	—	—	(65)
4	—	—	—	—	—	—	—	—	—
5	R 100	—	—	—	—	—	—	—	—
6	—	81	89	85	84	85?	87	85,2	89
	—	81.5*	94?*	82*	88*	78*	106*	88,2*	
7	51	57	59?	59	56	67	67	61	(58)
8	—	51	59?	52	54	(58?)	50	54?	(59)
9	—	—	—	—	—	—	—	—	—
10	—	72.3	72.8	74.6	73.8	67.3	72.4	72.0	74,1
	—	74.1*	73.3*	95.2*	76.4*	68.4*	87.0*	75.9*	
11	96.2	—	—	—	—	—	—	—	89,2
12	—	—	—	—	—	—	—	—	—
13	108°	101°	100°?	102°	100°	91°	95°	98.2°	99°
14	17.0	21.2	32.0	26.0	—	38.0	21.0	—	—
	—	—	25.0*	21.0*	—	22.2*	25.5*	—	—

B *Bilzingsleben* (*Vlček*), I—XI *and* m. *Solo* I—XI *and mean value*, * *Weidenreich 1943 1—14: table 17.*

find with the classic Neandertal individuals, La Chapelle, La Ferrassie and Circeo IX. In these individuals, too, Torus occipitalis is not developed and there is no strong angled occiput. The thickness of the occipital bone is low. Morphometrically, the Bilzingsleben cranial pieces were also compared with other fossil material: with finds of Homo erectus, i.e. with Pithecanthropus robustus, with Pithecanthropus erectus I, II, V, VII and VIII, with Sinanthropus II, III, X, XI, XII, with Solo-man I, V, VI, IX, X, XI, with Broken-Hill and with Vertesszöllös as well as with the early forms of Homo sapiens of Swanscombe, Steinheim, Ehringsdorf H and also with the Neandertal finds Gibraltar I, Saccopastore I, Circeo I, La Chapelle, Spy I and II, Le Moustier, Tabun I and with the finds of Homo sapiens palestinensis, Skhul V and Kafzeh VI and finally with other fossil forms of Homo sapiens (*tables 17—20*). It could be demonstrated here that the morphological characteristics of Os occipitale from Bilzingsleben correspond to those of Homo erectus pekinensis, and that they do not resemble the typical form of Homo sapiens.

Similarly, a comparison with some important characteristics of the Bilzingsleben Os frontalis was carried out. As we know already it consists of three fragments, of Pars glabellaris (B1), of the fragment of the frontal Squama (B2) and of a fragment of the left side (B3). The most significant feature, Torus supraorbitalis, forms a massive structure which is not interrupted in the Glabella region. It is very characteristic in its shape. We obtained the following measurements: 25 mm between Glabella and Crista frontalis the height of Torus in Nasion being 21 mm. Above Torus is the wide and smooth Depressio glabellae. In this find no Sulcus supraorbitalis is developed.

TABLE 19. *The dimensions of Os occipitale of Bilzingsleben in comparison with finds of Homo sapiens, in mm*

	B	Sw	St	EH	G I	S I	C I	CH	Sp I	Sp II	LM	T I	SK V	K VI
1	—	123	101	105	110?	117	113?	130.5	121?	131	111?	120	122	(120)
	—	—	102	110	—	—	—	122	—	—	—	—	—	—
2	—	118	—	117	106?	—	113?	115	—	—	103?	109	124	—
3	53	68	70	(77)	—	55	—	80	58.5	55	62	59	71	96
	—	—	—	66	—	—	—	74	—	—	—	—	—	—
4	—	—	—	51	—	—	52	40	—	—	42	—	—	—
5	R 100	—	—	—	—	—	—	—	—	—	—	—	—	—
6	—	94	88	87	81?	87	88?	91	—	—	87	90?	98	—
	—	—	89	—	—	—	—	—	—	—	—	—	—	—
7	51	61	64	68	(61)	51	53	67	55	52.5	57	58	66	88
	—	—	65	58	—	—	58	66	—	—	—	—	—	—
8	—	48	(43)	46	—	49	50?	38	—	—	41	—	51	—
	—	—	—	51.3	—	—	—	41.5	—	—	—	—	—	—
9	R 86	—	—	—	—	—	—	—	—	—	—	—	—	—
10	—	—	—	74.3	76.5	—	77.8?	79.2	—	—	(84.6)	83.3	79.0	—
	—	—	—	88.3	—	—	—	—	—	—	—	—	—	—
11	96,2	—	—	88.3	87.1	—	86.8	83.8	—	—	91.9	98.3	92.9	—
	—	—	—	87.9	—	—	—	—	—	—	—	—	—	—
12	—	—	—	100.9	—	—	96.2	95.0	—	—	—	—	—	—
13	108°	118°	108°	107°	110°	—	111°	111°	—	—	124°	120°	115°	—
	—	—	109°	—	—	—	101°	117°	—	—	—	—	111.5°	—
14	17.0	—	—	18.0	—	—	—	15.0	10.0	—	—	—	—	—

B *Bilzingsleben*, Sw *Swanscombe*, St *Steinheim*, EH *Ehringsdorf H*, G I *Gibraltar* I, S I *Saccopastore* I, C I *Circeo* I, CH *La Chapelle*, Sp I, Sp II *Spy I and II*, LM *Le Moustier*, T I *Tabun* I, SK V *Skhul* V, K VI *Kafzeh* VI. *1—14: Table 17.*

TABLE 20. *The dimensions of Os occipitale of Bilzingsleben in comparison with late palaeolithic finds from ČSSR (Matiegka) in mm*

	B[1]	Předností										Pm	P I[1]	D III[2]	B III
		I	II	III	IV	V	VI	VII	IX	X	XXII				
1	—	102?	—	110?	109?	106	—	105	105?	106?	100	106.3	111?	111	104?
2	—	122	115?	122	123	120	121	112	120	121	113	121.3	128	116	115
3	53	—	—	80[1]	75[1]	—	—	—	—	—	—	—	76	62[1]	60[1]
4	—	—	—	49[1]	48[1]	—	—	—	—	—	—	—	56	58[1]	55
5	R 100	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6	—	94	91?	100	101	101	101	90?	95	96	96	97.8	101	97	98
7	51	—	—	72[1]	68[1]	—	—	—	—	—	—	—	67	60[1]	57
8	—	—	—	46[1]	45[1]	—	—	—	—	—	—	—	54	55[1]	53
9	R 86	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10	—	77.0	79.1	81.9	82.1	84.2	83.5	80.4	79.2	79.3	84.9	80.6	78.9	83.6	85.2
11	96.2	—	90.0[1]	90.6[1]	—	—	—	—	—	—	—	—	88.1	96.8	96.4
12	—	—	93.9[1]	93.7[1]	—	—	—	—	—	—	—	—	96.4	94.8	96.4
13	108°	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14	17.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—

[1] *Vlček*, [2] *Jelínek*
B *Bilzingsleben*, I—XXII *Předmostí*, Pm *Předmostí mean*, P I *Pavlov I*, D III *Dolní Věstonice III*, B III *Brno III*
1—14: Table 17.

A further complex of features is Pars nasalis ossis frontalis. The nasal rooth is very large and wide. On the sides, marked Lineae temporales begin to develop which continue to pass into Os parietale. The preserved part of the frontal Squama shows a stronger oblique position. Unfortunately, the size of the frontal Squama can only be reconstructed. In the sagittal sections through the Glabella we find the closest similarity of the Bilzingsleben find with the finds from Olduvai 9 and Sangiran 17 (*table 21*).

In the Pithecanthropus forms Squama ossis frontalis is curved more markedly and Torus supraorbitalis is characteristically outlined by a distinct Sulcus supraorbitalis. Torus supraorbitalis of the above-mentioned Asian forms shows quite a different shape. In Homo soloensis, too, Torus supraorbitalis is different in form (*fig. 24*). In the finds from the Late Pleistocene in Africa (Broken-Hill, Saldana) we find a specific shape of Torus supraorbitalis which is quite different from the Late Pleistocene finds of Homo soloensis and, in principle, also from the Bilzingsleben individual. In the finds of Broken-Hill and Saldana we find already an indication of a division of Torus supraorbitalis in the glabella plane.

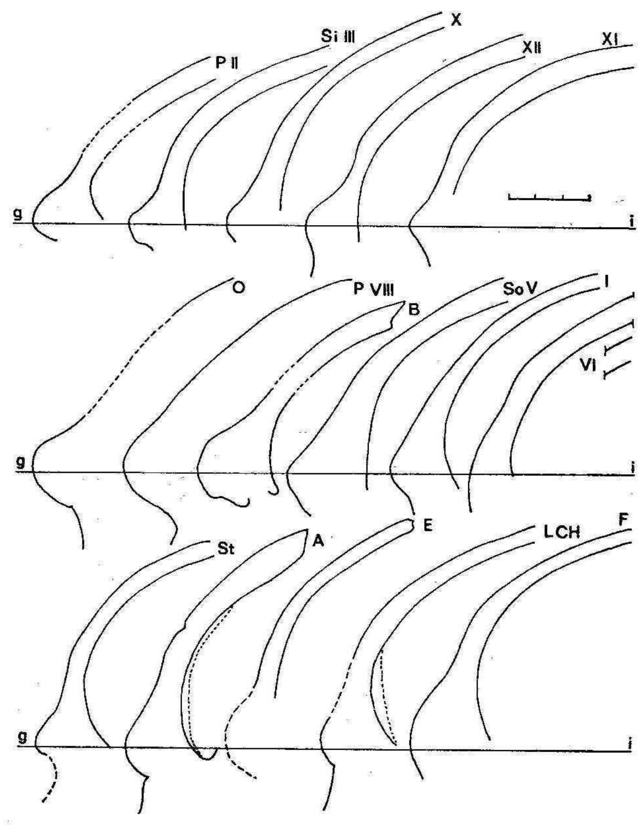


FIGURE 24. *Comparison of mediansagittal section of Os frontale from Bilzingsleben* (B) *with other fossil finds.* P II, VIII *Pithecanthropus*, Si III—XII *Sinanthropus*, O *Olduvai* 9, So *I—VI Solo*, St *Steinheim*, A *Arago* (*Tautavel*), E *Ehringsdorf*, LCH *La Chapelle*, F *La Ferrassie*.

TABLE 21. *The dimensions of Os frontale of Bilzingsleben man in comparison with finds of Early and Middle Pleistocene* (*Weidenreich*)

			P I	P II	P VIII	S III	S X	S XI	S XII	B	O	A
1	26	Mediansagittal frontal arc (n ∩ b)	(100)	107?	123	115	129	122	124	120 R	—	123
2	26/1	Mediansagittal glabellar arc (n ∩ sg)	(26)	—	28	25	28	26	32	42	48	33
3	26/2	Mediansagittal cerebral arc (sg ∩ b)	85	73?	93	88	96	97	91	75 R	—	90
4	29	Mediansagittal frontal chord (n — b)	(100)	90?	113	102	115	106	113	110 R	—	108
5	29/1	Mediansagittal chord of P. glabellaris	(19)	—	22	22	25	21	28	35	37	28
6	29/2	Mediansagittal chord of P. cerebralis	83,5	71	82,5	83	94	89,5	88	77 R	—	86
7	32/2	Glabella-Bregma-angle (g — b ∢ g — i = op	38°)	42,5°	45°	42°	45°	38°	42,5°	45°?	45°?	50°
8	32/3	Frontal inclination angle of P. glabellaris	(63°)	—	—	73°	70°	55°	65°?	58°?	67°?	85° g—i------
9	32/4	Frontal inclination of P. cerebralis	(37,5°)	—	—	39°	41°	38°	37°	40°?	38°?	75° g—op 45° n—i
10		Morant-Frontal-curvature (m — n ∢ n — b)	—	—	18°	22°	21°	24°	16°	10°?	13°?	37° n—op 14° [3]------

P I—VIII *Pithecanthropus*, S III—XII *Sinanthropus*, B *Bilzingsleben* (*Vlček*), O *Olduvai 9* (*Vlček, cast*), A *Arago-Tautavel* (*Vlček, cast*).

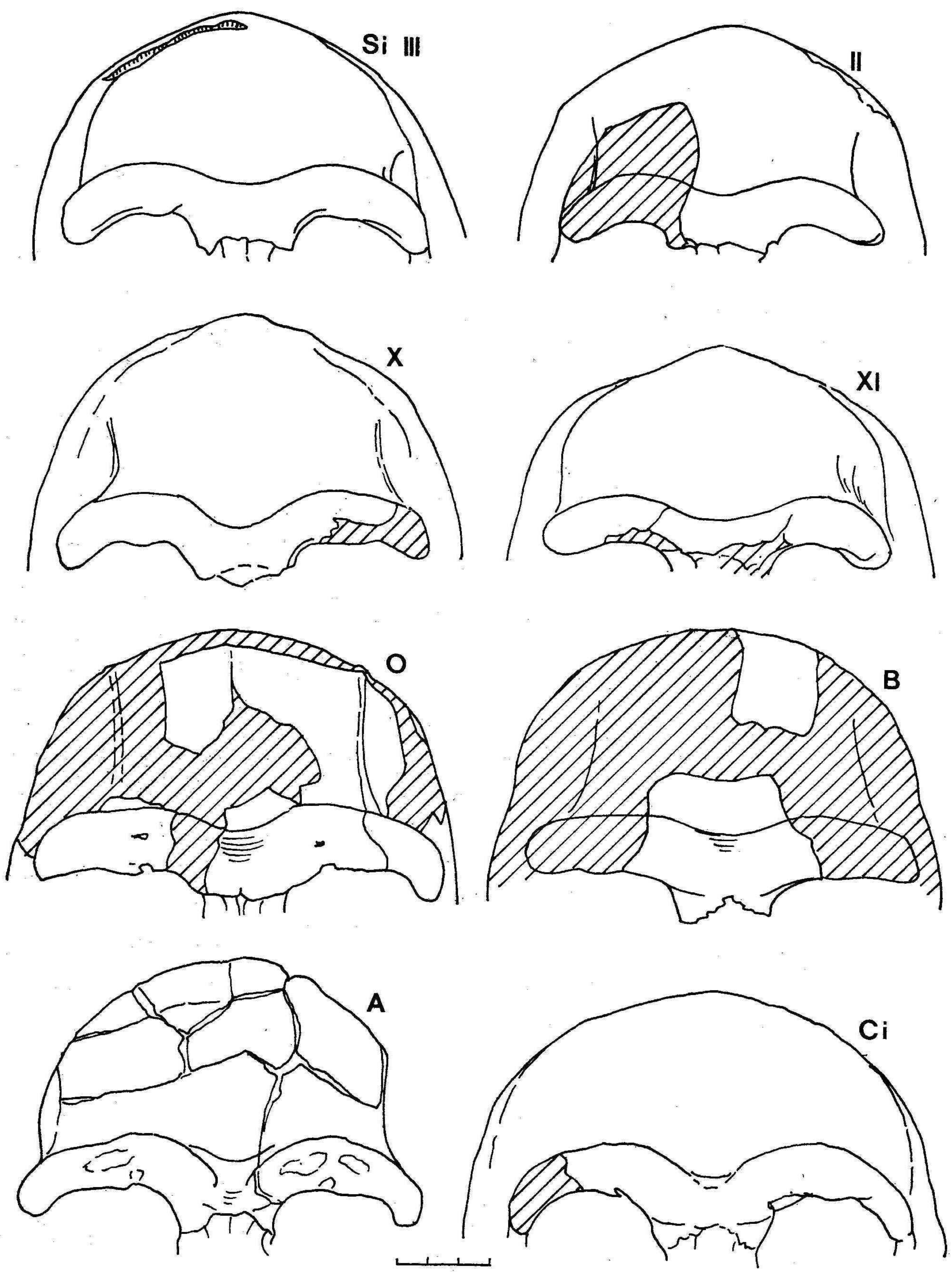


FIGURE 25. *Comparison of Bilzingsleben find* (B) *in Norma frontalis with Sinanthropus II, III, X and XI* (Si II—XI), *Olduvai 9* (O), *Arago* (A) *and Circeo I* (Ci).

European Middle Pleistocene forms were only found in Steinheim, Arago and Ehringsdorf. They show quite different shapes of the glabella region. To a certain degree, Torus supraorbitalis of the classic Neandertal forms is different from the Bilzingsleben. In Norma frontalis the frontal bone of the Bilzingsleben hominid agrees best with Olduvai-Hominid 9 and Sangiran 17 (P VIII, *fig. 16 and 25*). Corresponding measurements (*table 19*), also show that Bilzingsleben has a considerable resemblence with the forms of Homo erectus. The fact that the comparison of Os frontale from Bilzingsleben with the forms named above does not give such clear results as did the comparison of the occipital bone and the morphological and metrical analysis of the glabellar region of the frontal bone confirms that Bilzingsleben Man belongs to a Homo erectus form.

As we can see from this study the Bilzingsleben find shows the closest similarity with Sinanthropus III, Olduvai (Hominid 9) and Sangiran 17 (P VIII). We have used this similarity for the reconstruction of the probable shape of the neurocranium of the Bilzingsleben hominid. Casts of the fragments of Os occipitale and Os frontale were set into the calvarial casts of Sinanthropus III and Olduvai 9 (*figs. 26—27*). Thus, we have obtained possible variants of the reconstructed braincase of the hominid from Bilzingsleben. The sagittal sections of those reconstructions give us a good information, too, about their degree of accuracy by the comparison with sections of the braincase of Sinanthropus III, Olduvai 9 and Pithecanthropus VIII (*fig. 28*). Molar C1 corresponds also best to the dental forms of Homo erectus.

The fragment of Os parietale (D1) was equally put into the cast of Sinanthropus III and Olduvai 9 (*figs. 25—27*). Thereby, the morphological similarity of the individual from Bilzingsleben with the Sinanthropus III cranium became evident. The well shaped ramification of Ramus posterior of Arteria meningica media at the Parietale from Bilzingsleben (*fig. 19*) agrees best, by its shape and by its course, with the condition in Homo erectus (Sinanthropus, Pithecanthropus I, Gomboré II. Rabat and Ternifine—Saban 1975, 1977a). Ramus posterior is apparent in these individuals of Homo erectus, but Ramus anterior is only weakly developed. Ramus medius is also weakly developed and branches off Ramus posterior. In Homo sapiens it is not Ramus posterior, but Ramus

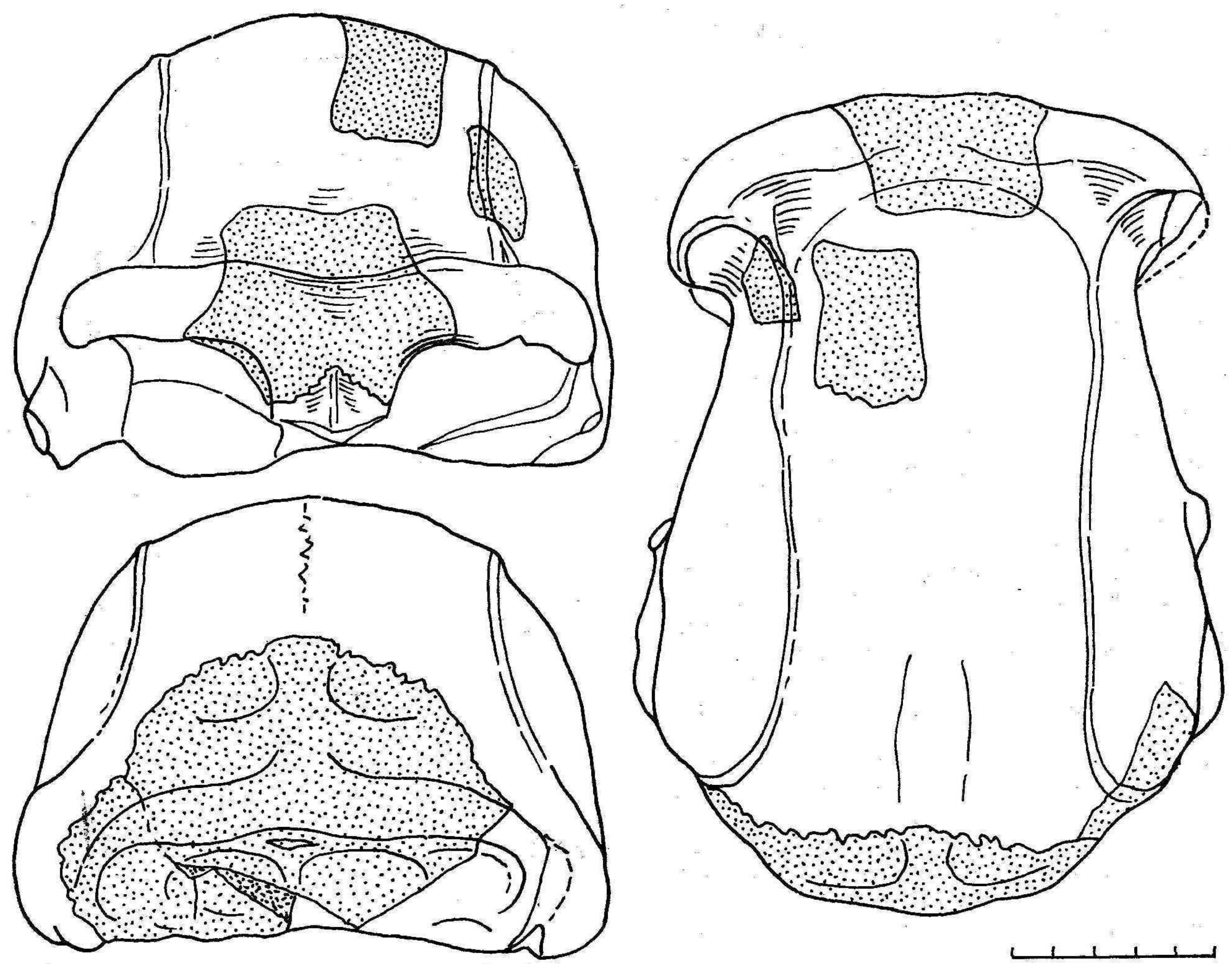


FIGURE 26. *The fragments from Bilzingsleben (A1, A2, B1-3, D1) are put into the skull of Olduvai 9 (Reconstruction E. Vlček 1980, 1983).*

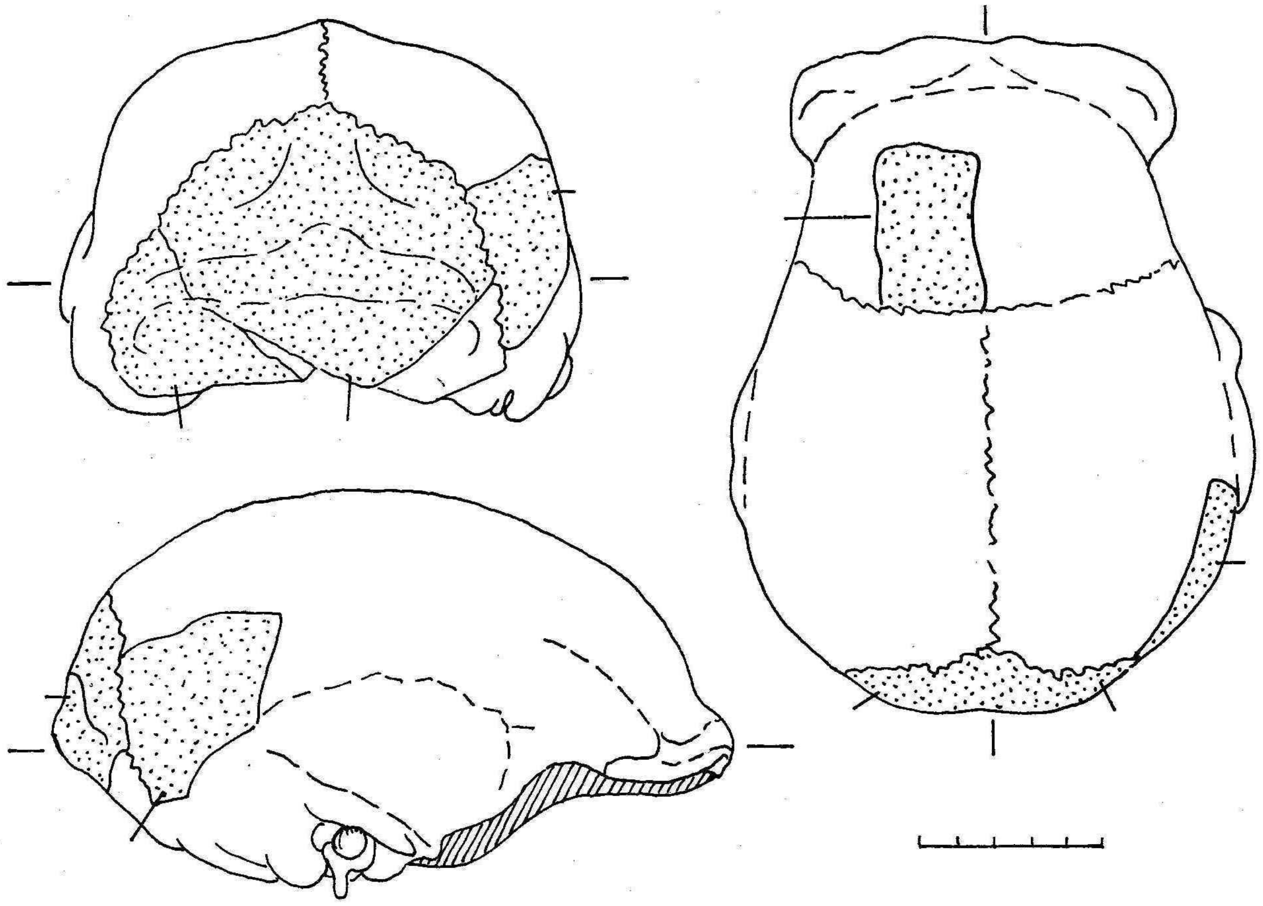


FIGURE 27. *The fragments from Bilzingsleben (A1, A2, B2, D1) are put into the skull of Sinanthropus III (Reconstruction E. Vlček 1979).*

anterior which constitutes the ramification and from the latter Ramus medius forks off. This is very typical in Neandertal men (La Ferrassie, Djebel Irhoud I, Sale—Saban 1977a, b). The find from La Chaise shows the same features. In Upper Paleolithic and in modern men the extension of the secondary and tertiary ramification of Arteria meningica media mainly forks off at Ramus anterior and medius (Mechta, Taforalt, Afalou[1] Döbritz—Saban 1977a, b and Homo sapiens Předmostí, Brno III — J. Matiegka 1929, 1934). A morphological comparison has shown that the Bilzingsleben hominid as regards the ramification of Arteria meningica media, corresponds to the forms of Homo erectus. The described development of the ramification of Arteria meningica media has phylogenetical significance.

In the ancestors of man, such as Zinjanthropus, Ramus anterior forked off the frontal branch of the Arteria. Ramus anterior is already developed independently in Australopithecus africanus and in Homo habilis and the frontal branch is forked off it. In early hominids such as Homo erectus, the ramification of Arteria meningica media was concentrated at Ramus posterior mainly. In Homo sapiens forms, finally, Ramus anterior forms the ramificatin of Arteria meningica media. In that point we agree with the arguments of R. Saban.

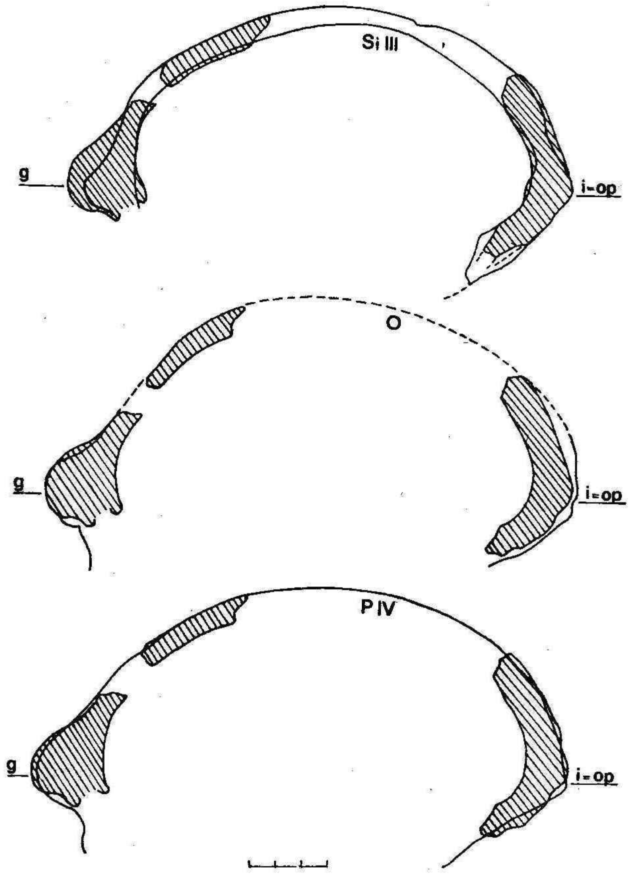


FIGURE 28. *The fragments from Bilzingsleben in median sagittal section, compared with Sinanthropus III* (Si III), *Olduvai 9* (O) *and Pithecanthropus IV* (*Sangiran 17*) (P IV).

3.4. *The variability of the Middle Pleistocene hominids in Europe*

The new palaeoanthropological finds of the last decades from Asia, Africa and particularly from Europe supplement the image, which was until then incomplete and indistinct, of the development of man in Europe during the Middle Pleistocene. In the last years further important finds like Arago-Tautavel, Vertesszöllös, Petralona and recently near Bilzingsleben were made besides those known from the previous years made in Heidelberg, Swanscombe, Steinheim, Ehringsdorf and Montmaurin.

This paper is based on the morphological confrontation of the Bilzingsleben find with the finds mentioned above consisting of the Neurocranium or of its parts. They are the finds from Swanscombe, Steinheim, Ehringsdorf BCDH, Arago, Vertesszöllös and Petralona. Many authors have examined the morphological characteristics and the taxonomic classification of these finds (Swanscombe: Le Gros Clark 1964, Morant 1938, Stewart 1964, Breitinger 1964, Brothwell 1964, Weiner 1964, Campbell 1964; Steinheim: Berckhemer 1933, Weinert 1936; Ehringsdorf: Weidenreich 1928, Hrdlička 1930, Behm-Blancke 1960; Arago-Tautavel: H. de Lumley and M. A. Lumley 1979; Vertesszöllös: Kretzoi and Vertes 1964, Thoma 1966, 1967, 1969, v. Königswald 1967, Wolpoff 1971. Breitinger is going to write a monograph about Petralona. Only some limited informations about it were published (Kokkoros and Kanellis 1960, Bostanci 1964, Breitinger 1964, v. Königswald 1967, Poulianos 1967, 1971, Hemmer 1972, Stringer 1974). D. Mania, V. Toepfer, H. Grimm and E. Vlček wrote publications about the latest find from Bilzingsleben. The authors have different opinions about the taxonomic classification of a whole series of finds. The finds from Swanscombe and Steinheim were evaluated without any difficulty, all scientists counting them to Homo sapiens, more exactly to the phylogenetic subspecies of Homo sapiens steinheimensis. H. and M. A. de Lumley introduced the term of "Anteneandertal man" for the finds from Arago. This term is also used for the finds from Montmaurin and for the finds from the southern region of Europe. A. Thoma considers the finds from Vertesszöllös to belong to the new subspecies of Homo erectus seu sapiens palaeohungaricus n. ssp. Some scholars ascribe this find to the Neandertal man (v. Königswald 1967), others are more inclined to stress the Homo erectus affinity as is M. H. Wolpoff (1971). Similarly, the find from Petralona is counted to the Neandertal Man, but others regard it as Homo erectus (Hemmer 1972, Stringer 1974). The taxonomy of the Ehringsdorf finds is also not unanimously agreed. Presently, the author has finished his studies about the Ehringsdof finds. The new reconstruction of the cranium H reveals its affinity to Homo sapiens.

The comparison of Bilzingsleben with other European finds and with the Middle Pleistocene finds from Africa and Asia enables us to regard them as Homo erectus. This contradictory evaluation of the European finds is reflected in all papers until 1976. Even today there exist quite diverse opinions:

1. According to one group of scientists there are Homo erectus forms in the terminal Lower and Middle Pleistocene in Europe penetrating from East and North Africa to the European continent. Here they developed to various sapiens forms.

2. The second group of scholars claims that only the sapiens forms reached the European continent during their phylogenetic development.

3. There is a different interpretation concerning the mosaic development of the populations in the Middle Pleistocene of Europe. Stringer 1981 as well as Howells 1980, are of the opinion that all human fossils found in the Middle Pleistocene in Europe have to be ascribed to the Homo sapiens forms and they suggest that in Europe there didn't exist a Homo erectus stage of development and its transitional forms to Homo sapiens. E. Vlček 1978 and 1980, however, differentiates, by virtue of the greatest morphological contrasts of Os occipitale and of the base of the skull the erectoid forms with the bulging Os occipitale from the sapiens forms with the characteristically curved occipital outline.

In order to express the difference he introduced the taxon n. ssp. Homo erectus bilzingslebenensis constituting the morphological antipode to the contemporary subspecies of Homo sapiens steinheimensis. Of late, Protsch 1981, has maintained a similar standpoint by counting the find from Bilzingsleben to the erectus forms. Recently, also M. A. and H. de Lumley 1979 have published their opinion about this problem determining, on the one hand, a new subspecies of Homo erectus tautavelensis for the find of Arago and completing, on the other hand, when reconstructing the skull the missing portions of Os occipitale with the find from Swanscombe and of Os temporale according to the corresponding Sinanthropus morphology.

Stringer, Howell and Howells ascribe the find from Bilzingsleben to the sapiens forms, i.e. to their first stage of transformation process along with finds from Mauer, Vertesszöllös, Arago as well as with those from Steinheim and Swanscombe. Jelinek, 1980, stresses when analysing the Bilzingsleben fragments the similarity of the glabella region with that of the classical Neandertal men (La Ferrassie) equating the occipital portions with the morphology of Homo erectus forms.

Wolpoff 1977, and 1980, regards the finds from Vertesszöllös, Petralona and Bilzingsleben as erectoid.

The difficulties and uncertainties having arised when the find was evaluated are due to the following reasons: 1. Inexact or insufficient dating of the single finds which does not lead to any reliable correlation. 2. For the time being, we do not know but individual finds and, up to now, not a single population derived from one locality. This explains our insufficient knowledge of the typological, sexual and individual variability of the finds from the part of Europe lying between England and Greece.

Ad 1: The following chronological dates and informations concerning the absolute age of the European finds have been found so far: Mauer 450 000 years B. P., Petralona 700 000—330 000 years B. P., Arago 450 000—330 000 years B. P., Vertesszöllös 475 000—225 000 years B. P., Bilzingsleben 400 000—

300 000 years B. P., 340 000—300 000 years B. P., 228 000—220 000 years B. P., Swanscombe 220 000 years B. P. Steinheim: similar to Swanscombe, by virtue of the fauna. Ehringsdorf: 220 000—120 000 years B. P. Gánovce: 220 000—120 000 years B. P.

From this list of datings it is evident how uncertain the method of dating finds may be, the fact reflected in the different evaluation of the morphological features and their combinations.

Ad 2: After having studied the cranial morphology we are going to mention some aspects referring to Bilzingsleben and, additionally, to Petralona and Arago finds. According to the morphology of Torus supraorbitalis and of Torus occipitalis there are three morphological types to be distinguished (*fig. 29*): In type A Torus supraorbitalis is formed by a wide and thick structure which is not interrupted in its complete length. It is of roundish form and, frontally and vertically not thinner in the glabella region. Lineae temporales on frontal Squama are double lines. These features occur along with a bulging Os occipitale, with a low Planum occipitale and with a completely flat Planum nuchae. The maximal skull length coincides with Inion. Lineae temporales continue to pass into the Asterion region where they form a distinct thickening of Os parietale.

The finds from Bilzingsleben and from Olduvai have displayed the same characteristics, Olduvai Hominid 9 constituting the best analogy to Bilzingsleben.

In type B Torus supraorbitalis is equally formed by a bulge. There is a differentiation of the originally uninterrupted mass of Torus, a groove forming on this mass in the median plane. From Incisura frontalis there start some oblique-lateral grooves separating the median from the lateral parts. These are still strong here. Proximally, ;the bulge of Torus supraorbitalis stands out against Squama of Os frontale. The frontal surfaces of Torus are flattened. Lineae temporales are not distinctly developed on Os frontale and they are not doubled. The configuration of the neck parts is equally typical. The occipital bone is strongly curved. The maximum length of the skull coincides in the point of Inion, the height of Planum occipitale is equal or somewhat superior to type A. The prolongation is accentuated by an ossification core in Fonticulus minor and by Os incae. Os incae sets out from the ossification core and lies between the two parietal bones (finds from Arago and Atlanthropus). Planum nuchae is flat, but still concave. Lineae temporales equally merge into the Asterion region forming here a massive thickening of the posterior part of Ossa parietalia. The finds from Arago, Vertesszöllös as well as those from Petralona display this morphological complex of features. There are also analogies to the Broken-Hill skull and according to the formation of the endocranial characters equally to the finds from Gánovce. In type C Torus supraorbitalis is formed by a bulge consisting of two arches smoothly merging in the Glabella region. Torus is of

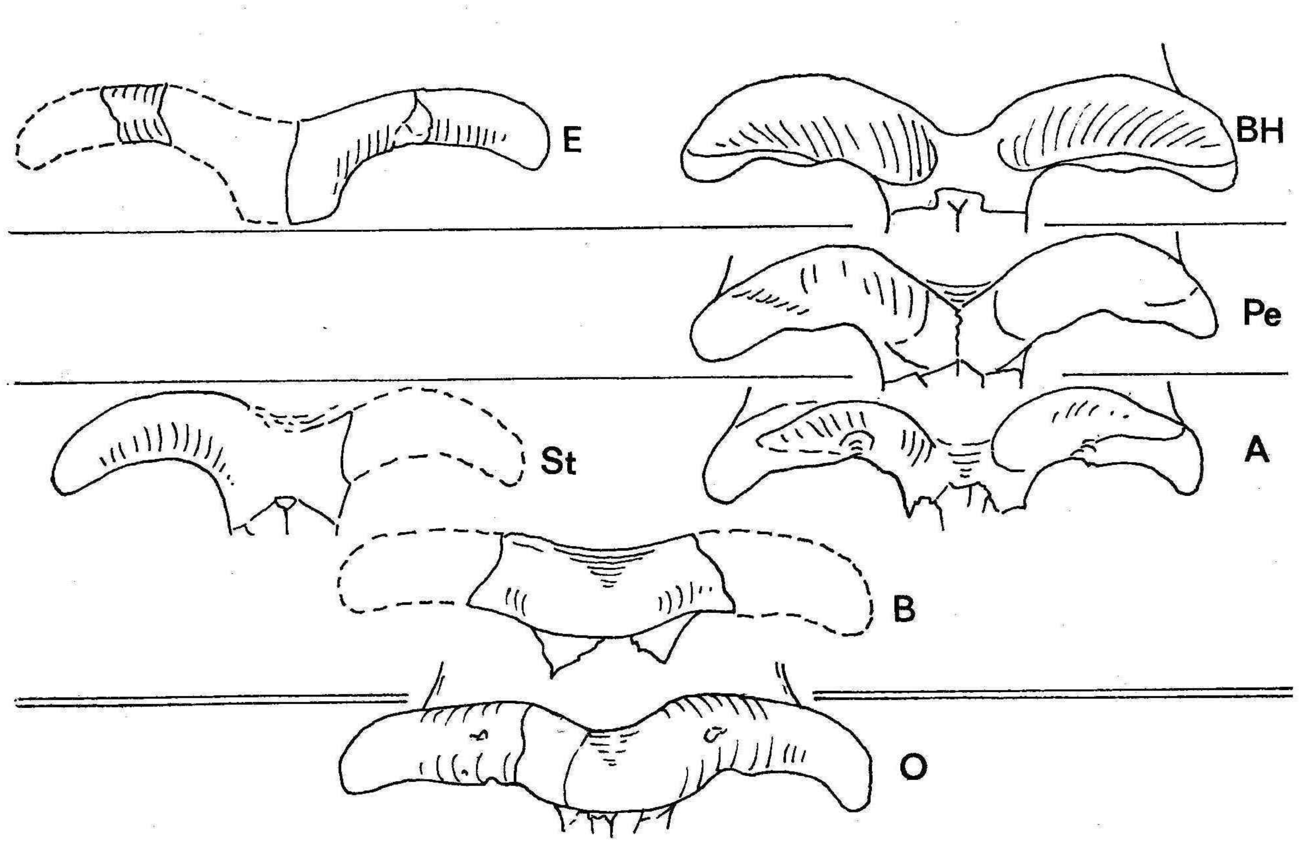


FIGURE 29. *The formation of Torus supraorbitalis in Middle Pleistocene Hominids.* O *Olduvai* 9, *Bilzingsleben,* St *Steinheim,* A *Arago* (*Tautavel*), Pe *Petralona,* E *Ehringsdorf,* BH *Broken-Hill.*

roundish form, but its strong formation decreases laterally. Powerful Lineae temporales are developed on Os frontale. The occipital part is curvo-occipital. The maximum length of the skull does not agree with Inion which is located high above this point. Planum occipitale is vaulted and tall. Equally, Planum nuchae is vaulted. Lineae temporales are only slightly developed on the parietal bones. Ossa parietalia are not thickened in the portion of the posterior angle.

The finds from Swanscombe and from Steinheim as well as the smaller group of finds from Weimar-Ehringsdorf belong to this group. The comparison of the Middle Pleistocene finds from Europe studied from this aspect displays the greatest morphological resemblence of the Bilzingsleben with the more ancient find of Homo erectus from Olduvai (Hominid 9) belonging to group A. Further analogies to group B are evident. The Petralona skull belonging to it displays morphological features most developed, which is confirmed by further characteristics such as the endocranium not agreeing with the erectus skull any longer. This could also be asserted in the Arago skull. Thus, it has been found out that the find from Petralona shows affinities to the Pre-Neandertal men from Gánovce and Broken-Hill. For morphological reasons and probably for chronological reasons as well the Petralona skull must be considered to be markedly younger than supposed before. Group C comprises the finds from Swanscombe and from Steinheim. They enable us to explain the differences at the skull and of the thickness od their bones by sexual dimorphism. Their sagittal and occipital form is developed in the characteristical manner of Homo sapiens. This could also be studied in the younger assemblage from Weimar-Ehringsdorf with the neocranium having the typical house-form. So we can see that apart from the finds with predominant erectus features there are finds with distinct sapiens characteristics. The differences especially concern the sagittal and the occipital region their formation and the morphology of the base of the skull being typical for the manner of carrying the head, as can be shown by the muscle relief on Os occipitale and in the formation of the endocranium in the cerebellum region.

These differences mentioned belong to different chronological horizons:

1. In the penultimate interglacial (Holstein complex) there existed some forms with erectoid features (finds from Bilzingsleben, Arago and Vertesszöllös) along with forms already bearing typical sapiens-like characteristics (Swanscombe and Steinheim).

2. In the penultimate glacial (Saale complex) and in the last interglacial (Eem) we can trace these differences in further combinations. The finds from Petralona, Gánovce, Broken-Hill and the early Neandertals (Monte Circeo, Gibraltar) are opposite to the Ehringsdorf group.

3. At the beginning of the last glacial (Weichsel) there existed only sapiens-like forms such as the classical Neandertal Man besides the finds of modern sapiens type, e.g. Kafzeh, Skhul, Šala, Ochoz and Šipka.

4. From the middle phase of the last glacial (Weichsel) until today only modern forms of Homo sapiens exist: Crô-Magnon, Brno or Combe-Capelle type and Dolní Věstonice. To sum it up we can state that in the terminal Holstein interglacial there lived two forms of men in Central Europe: The forms of Homo erectus and the forms of Homo sapiens the latter already being characteristically formed. In the following phase of the penultimate glacial we only find the form of Homo sapiens in Europe.

The Middle Pleistocene finds at our disposal including the mandible from Mauer represent a period of about 300 000 years. At present it seems that in Europe there is no evidence of the existence and development for the forms of Homo erectus with a small capacity of the neurocranium below 900 ccm such as are known from Java. In the Middle Pleistocene much younger forms of Homo erectus came to Europe with a cranial capacity higher than 1 000 ccm what is proved by the finds from Bilzingsleben and Vertesszöllös.

Chronologically and morphologically, these forms correspond to the East African finds of Homo erectus olduvaiensis, Olduvai 9 (Tobias) and to the find of Homo erectus, type Sangiran 17, from Java.

In Central Europe, man developed in close relation with the populations in South Europe, North and East Africa. The exact taxonomic classification of the European finds from Middle Pleistocene is very difficult because their morphological variability changed with different speed and intensity in different periods and different geographical areas. We are quite sure of one thing: During the upper zone of the Holstein complex, i.e. between the Mindel and Riß glacial there are types in Central Europe with prevailing Homo erectus characteristics (Bilzingsleben, Vertesszöllös), whereas in Western Europe forms with Homo sapiens traits predominate (Swanscombe, Steinheim). In the following penultimate glacial (Riß, Saale) and in the last interglacial (Eem, Riß/Würm) the development of the forms of Homo sapiens advanced in at least two qualitatively different directions. One direction led to the characteristic Neandertal Man what can be studied in the Riß finds of the so--called Ante-Neandertals from South Europe (Arago etc.).

In the last interglacial this development led to the so-called Pre-Neandertal forms whose cranial capacity is about 1 200 ccm (Saccopastore, Gibraltar, Gánovce) and who might have been a base for the development of the Neandertal Man in Europe: Homo sapiens neanderthalensis (La Chapelle, La Quina, Neandertal, Spy, la Ferrassie, Le Moustier), on the Crimea (Kiik-Koba, Zaskalnaja VI) as well as in Anterior Asia and Central Asia (Tabun, Teshik-Tash).

We also have finds in Central Europe at the end of the penultimate glacial which are characterized by a marked development in the direction of Homo sapiens. In the first line, these are finds from Weimar-Ehringsdorf B, C, D and H. Besides Os occipitale typical of Homo sapiens and the vaulted Squama ossis frontalis and despite the marked Torus supraorbitalis these finds still have a further typical Homo sapiens characteristic: the typical Tuber parietale. For the first time we have the neurocranium of the modern type as house-form shape in Norma occipitalis. The further development of these forms led to modern man. In the first part of the last glacial (Würm/Weichsel) we find these forms in Central Europe as transitional Neandertal Man (Šipka, Ochoz, Kůlna, Šala, Subalyuk).

Chronologically and morphologically, Central European finds correspond to the types of Homo sapiens palestinensis from Anterior Asia (Shanidar, Amud, Galilea, Skhul, Kafzeh). The finds from Krapina represent a further group. To conclude we can say that already at the end of the penultimate interglacial there is evidence of the existence of Homo erectus forms apart from the subspecies of Homo sapiens steinheimensis. The finds from Bilzingsleben belong to this Homo erectus.

We have sufficient evidence for the transformation of these forms into Homo sapiens types (Vertesszöllös, Petralona). In the range of variation of these transitional forms we can state that there are some evolutionary extremes which show the specialisation into the direction of the Neandertal and into different Homo sapiens groups.

3.5. *Conclusions*

The outcome of this study can be summarized as follows:

1. The fragments of the skull of the Bilzingsleben hominid found so far morphologically belong to Homo erectus.
2. The Bilzingsleben hominid shows the greatest similarity to the individuals of Sinanthropus III, Olduvai (Hominid 9) and Pithecanthropus VIII (Sangiran 17). Certain differences between the find from Bilzingsleben and, above all, the Asian forms of Homo erectus can be regarded as a geographical effect of the variability of Homo erectus in Europe.
3. Therefore the term of Homo erectus bilzingslebenensis was postulated (Vlček 1978).
4. The find from Bilzingsleben proves the existence of two morphologically different forms of the fossil man living in Europe at the same time during the Middle Pleistocene. They are the Homo erectus forms represented by the finds from Bilzingsleben and Vertesszöllös and the Homo sapiens forms confirmed by the finds from Swanscombe and Steinheim. We are convinced that during the systematic research on the "Steinrinne" near Bilzingsleben further finds will be recovered enlarging and improving our knowledge about the evolutionary forms of man in Central Europe.

4. THE ARCHAEOLOGICAL CULTURE OF THE BILZINGSLEBEN HOMO ERECTUS

On the marginal terrace the finds were largely in original position. Various find associations could be recognized on an area of 200 m² limited in the north and east by the shore of a shallow lake. They represent several workshops, remains of three dwelling structures and some activity zones in their vicinity (*fig. 8*).

4.1. *Workshops*

Each workshop could be identified by an anvil lying in the centre, by some unfinished specimens, by choppers and chopping tools and by refuse (*plate 3,3*). Large slabs or blocks from limestone and quartzite, once even the tibia of an elephant and in another case a one metre long part of a great tusk had been used as anvils the latter two being supported by stones and bones. Furthermore, one anvil from travertin was placed on the joint of the Ulna of an elephant which was lying in a small depression of the loess surface. All anvils bear numerous traces of banging and battering. Several times, small substances of bone and antler could be found in the cavities of the anvil surfaces. Repeatedly, large pieces of bone from elephants were found lying on the anvils the former being worked.

In one case it was a 150 cm long humerus of an elephant whose proximal end had been struck off and which had been reposed beside the anvil. The cutting edge of a chopper equally adjacently laid down fits into the hole of fracture on the humerus shaft. Numerous flakes were spread round the workshops. Most of the other workshops served as well for smashing and working the bones. At some of them were various chipped and flaked stones, above all, silex.

The anvil made from the elephant tibia, however, was used for working wood. In its vicinity there were some calcified wood splinters and stick remains and about 1—2 m away several up to 2,6 m long rod-like wood remains were recovered. The implements found at the workshop were preferably hammer-stones, choppers and chopping tools from limestone, quartzite, chrystalline and travertin. Close to each dwelling structure two workshops were discovered. It can be assumed that two workshops also existed beside the third object. In four cases some bone artifacts bearing deliberate cutting marks were found at workshops.

4.2. *The dwelling objects*

They consisted of circular and oval accumulations of large bones and stones diffusely distributed (slabs, blocks, pebbles) at one case forming an oval of 4×3 m and in two more cases forming circles of a 3 to 4 m diameter (*fig. 8 and 30*). South-east of each circle an entrance could be recognized in front of which there was a hearth. At the oval structure the fireplace was demonstrated by numerous charcoal remains and stones showing the influence of fire. The other two objects delivered only few charcoals, but many stones changed by fire were sufficient evidence of the hearths. Presumably, the three structures are simple dwellings of tent-like shape. In one of the circular structures there was a 2,5 m long tusk which evidently once had been erected in the centre of the object with a propping function. At the margin of the structures 8—10 large tools of bone and of antler as well as a great rod-like piece of a wooden tool were found. Two of the structures were situated close to each other the third one being about 5 m away.

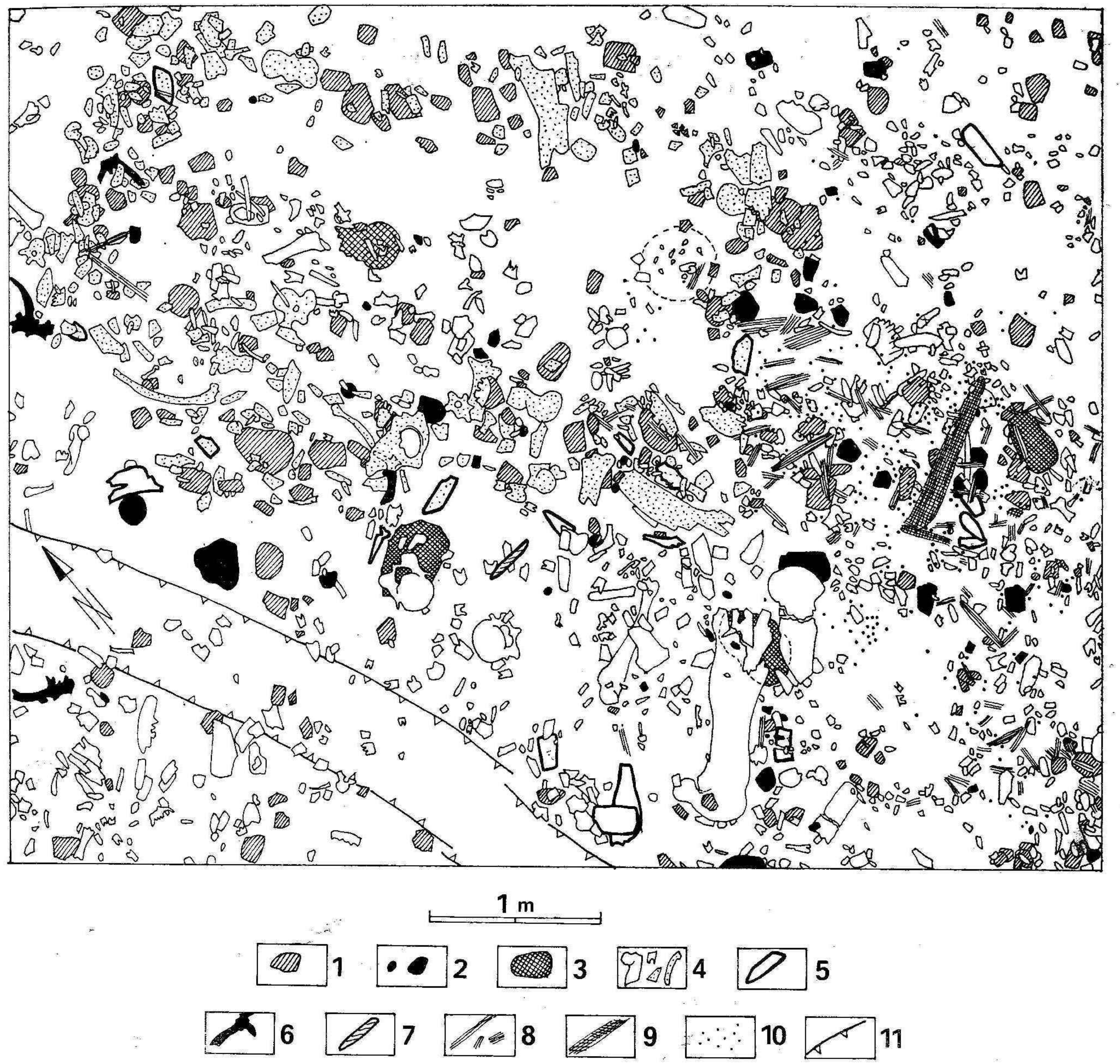


FIGURE 30. *Bilzingsleben. Section of the excavation area. 1 stones, 2 pebble tools, 3 anvils, 4 bones of large mammals, 5 bone tools, 6 antler tools, 7 bone artifact bearing deliberate engravings, 8 wood remains, 9 charred piece of tree trunk, 10 small pieces of charcoal, 11 crevice. — Bones drawn with dotted surface: oval dwelling object remains.*

4.3. *Activity zones*

Archaeological assemblages are given this term inferring to particular activities carried out by Homo erectus. Many antler tools—cudgels and mattocks—are concentrated on the margin of the occupation terrace indicative of a special activity zone in the vicinity of water. Associated with them is the occurrence of large, up to 80 cm long planes made of large flakes from elephant bone. East of the shelters an area of about 5 m² was excavated containing some large bone tools, especially chopping tools with fractured and worn cutting edges as well as two bone planes. On the marginal terrace, in the neighbourhood of the activity zones with fewer garbage than waste from stone; bone, antler and ivory remains left over after the tool manufacture, there is an abundance of waste material found beyond the shoreline in the shallow lake basin. This zone can be imagined to have been the refuse heap of the occupation floor.

4.4. *The artifacts of the Homo erectus from Bilzingsleben*

4.4.1. *Pebble artifacts*

They consist of quartz, quartzite, shell-limestone, travertin and chrystalline rock (Weber 1979, Mania 1986a). This raw material comes from river gravels, from other glacial sediments and from slope debris of the vicinity. The nearest occurrence of porphyry pebbles is in the river terracess having been transported at least 4 to 5 km. It must be assumed that there were even longer transports for quartzite occurring relatively rarely in the glacial sediments from which they are derived. For geological reasons, it can be assumed that the whole material consisting of the aforementioned "foreign" stones—including the unworked pebbles—had been carried to the site by man. Thus, unworked "manuports", pebbles bearing traces of use as well as flaked pebbles can be distinguished. To date, a total of about 5 000 of such artifacts has been uncovered. Those which were used and flaked can be differentiated according to their wear patterns. Larger slabs and blocks having served as anvils for different activities contrast with the artifacts used actively, viz. by hand. Mainly, they are tools for striking, such as smashing, disjoining, beating, hammering and chopping.

The following wear patterns can be recognized:
—percussion eyes
—percussion scars
—fractures on corners and edges
—smashed corners and edges
—rounded corners and edges
—marks of cutting, scratching, grinding and rubbing on plane surface parts. Strike scars of different size developed either indirectly on anvils or directly on tools used for striking.

There are the following modes of use:
—smashing
—splitting
—chipping

Two groups of hammerstones can be distinguished. One group comprises hammerstones largely bearing no marks of fashioning and consisting of oval quartz pebbles about 3—10 cm long (*figs. 32, 18*). The other group includes larger, heavier hammerstones of quartzite and shell—limestone. Both show similar patterns: scars, eyes, marks of fracturing. The quartz hammerstones presumably served for the working of silex. Others, very large and heavy pebble tools are chipped by single-facial or bi-facial trimming carried out once or several times on one, less frequently on several edges (*fig. 31*). Artifacts trimmed all over the surface are rare.

These fashioned pebble tools received either chopper-like cutting edges or cone-shaped points which were used for work. For the most part, they show fractured or smashed, but also completely rounded working edges and angles. Fine edge trimming occurs rarely and is mostly observed in quartz artifacts. In a few cases, larger flakes of quartz, quartzite or shell-limestone were being fashioned. These artifacts, however, resemble some types of silex tools.

4.4.2. *Silex artifacts*

Artifacts of silex bear outstanding characteristics as far as their small size and their special forms are concerned. By the end of 1985, about 100 000 specimens were excavated. They include 23,4 % wrecked pieces, 61,5 % flakes and 15,1 % implements. As raw material served pebbles of senon silex occurring in the Elster glacial deposits and later getting into the river gravels. First, the pebbles were smashed, then the wrecked pieces were trimmed for the purpose of manufacturing tools or obtaining flakes for implements. Corresponding to the use of hammerstones the

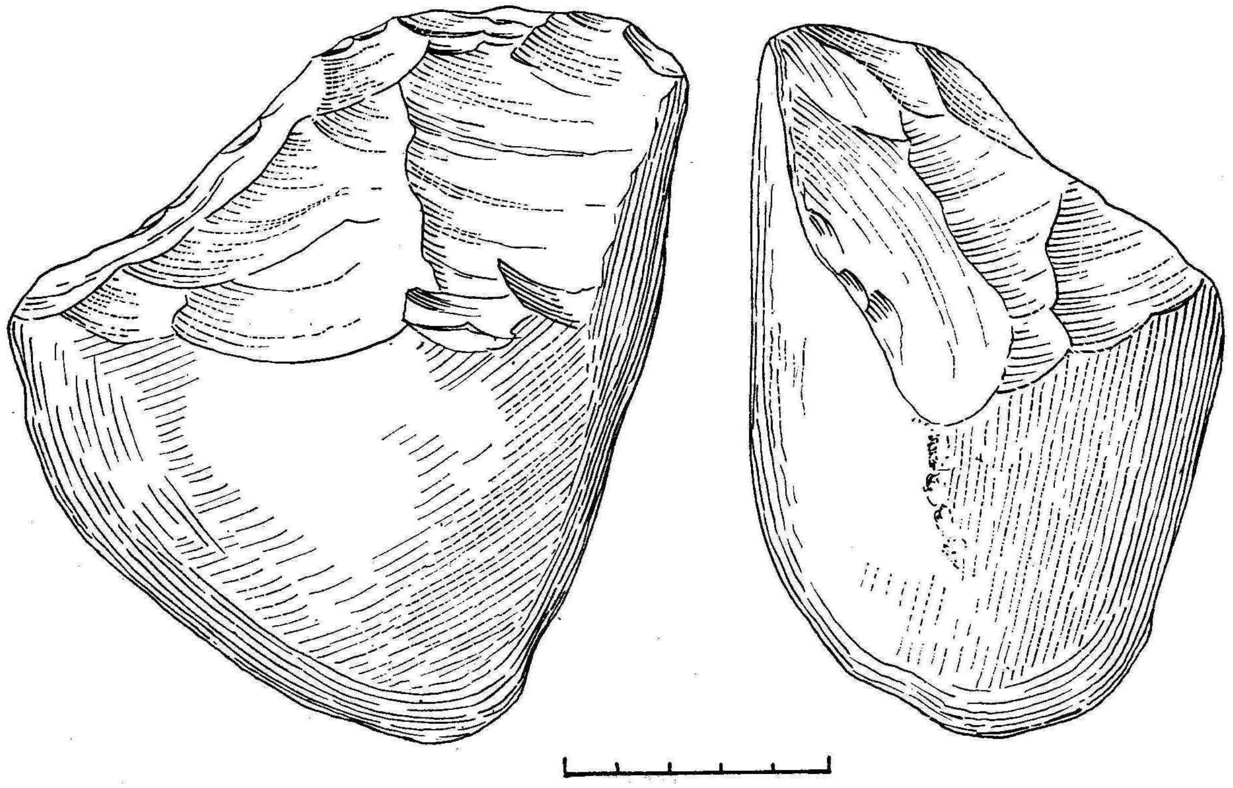
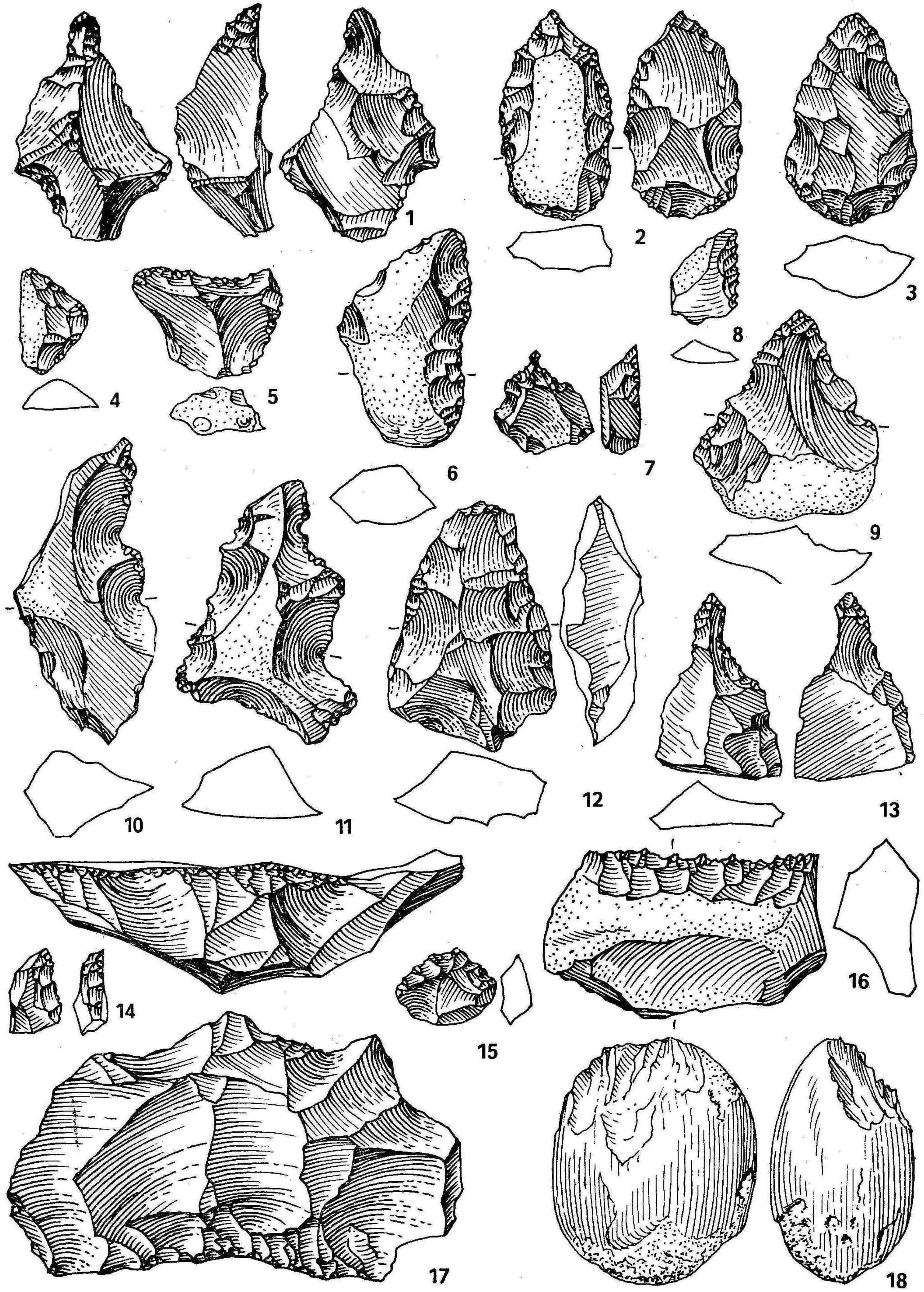


FIGURE 31. *Bilzingsleben. Quartzite chopper.*

FIGURE 32. *Bilzingsleben.* 1—17 *silex tools,* 18 *quartz hammerstone* — 1 : 1.



flakes and chips are relatively thick and broad and they display broad remnants of striking platforms, distinct bulbs of percussion, broad percussion eyes and angles of percussion of 90—120°.

In some cases, the cores for the manufacture of flakes were prepared in a special manner. Implements are comprehended as specially worked wrecked pieces, flakes and cores, viz. the so-called retouched pieces. As a rule, they are 2—3 cm long, less frequently they are pieces up to 6 cm long or longer. The smallest tools distinctly worked are of microlithic nature. Their size varies between 8 and 20 mm. The Bilzingsleben silex artifacts were manufactured according to the following sequence: 46,2 % from wrecked pieces, 23,9 % from natural pieces and 29,9 % from flakes. For the most part, their edges were worked, less frequently their surface is retouched. The special forms of the worked edges seem to be due to functional reasons (*fig. 32*). Therefore, the Bilzingsleben artifacts can be divided into several main forms each constituing a great width of variability.

They appear to have already been rather specialized tools having preferably served for the working of other, presumably, organic raw materials and for the manufacture of other implements. The edges are more heavy-duty and they are straight, concave, convex or denticulate, with notches and with indents. There are particularly worked prolongations looking like borer-shaped points. There are elongate flakes having a back and a long cutting edge the anterior end of it being denticulate. Other pieces are of scraper-shaped nature. Retouched edges frequently coincide at points. There are points retouched on edges and on faces. The largest specimens are believed to have served as tools for cutting and sawing. Smaller, less heavy-duty pieces were preferably used in paring activities as can be inferred by their wear patterns. Other tools bear characteristics for scraping, boring and punching.

4.4.3. *Wear patterns on silex artifacts from Bilzingsleben*

Microscopic analyses of wear patterns carried out on 15 % of all pieces retouched show that a considerable number of these artifacts bear wear patterns (Gramsch 1979). There is always a correlation of the wear patterns and the dressed edges. To date, only linear, straight, parallel scratches or small polishing furrows could be recognized forming an angle of 45—90° with the retouched edge. They are arranged in groups on the portion of the ventral or on the bottom surface of the artifact immediately adjacent to the edge retouched. Artifacts of longer-lasting usage show some convex microstructures on the silex surface with additional polish. The patterns occur in all types of edge dressing and in artifacts of all sizes, even in pieces smaller than 1 cm. The wear patterns indicate a paring function of the artifacts as well as scraping and carving of organic material, e.g. of wood and of bones.

4.4.4. *Artifacts of organic material*

The occurrence of artifacts made of antler, bones and ivory is a striking characteristic of the site of Bilzingsleben. Wood implements preserved in a calcified state were found on the inhabited lake-shore zone. They are chips and straight rods which can be imagined to have constituted manufacture waste and artifact remains. By 1985, 207 tools of antler were excavated (*fig. 33*, Mania 1979, 1986b). They consist of antlers shedded and of antlers from red deer kills. As a rule, they are mattock- or cudgel-like tools manufactured with the crown and with one of the two basic prongs broken off the latter being for the most part the second prong. Only rarely these parts can be believed to have been chopped off by means of a heavy pebble tool. The mattock-shaped tools display different stages of utilization going from fractured butts of the first prongs to artifacts entirely worn the latter resembling the cudgel-like tools formed by the removal of the two basic prongs. The wear patterns suggest the working of harder materials. They are limited to powerful fractures; only rarely roundings on the butts utilized can be observed. There is an abundance of single prongs produced by the trimming of these tools as well as when broken off during usage.

About 250 bone artifacts can be recognized according to characteristics of their deliberate working and according to their wear patterns (Mania 1979, 1986a). There are the following trimming techniques:

- unsystematic smashing of long bones in order to obtain larger compacta pieces.
- systematic splitting of long bones by means of wedges.

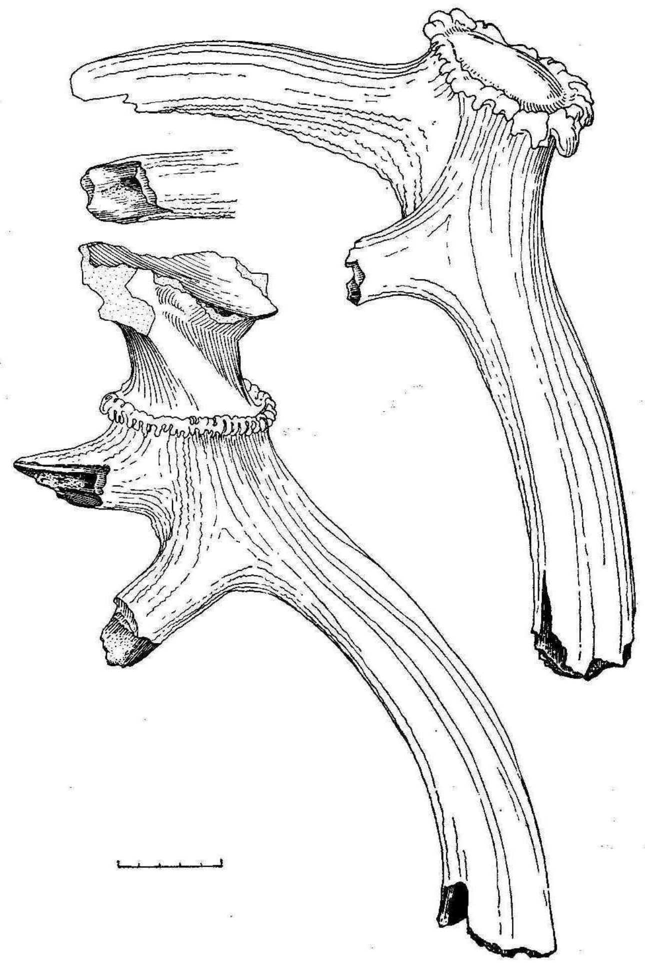


FIGURE 33. *Bilzingsleben. Antler tools.*

- chopping off of bone parts with the aid of heavy pebble tools.
- trimming of utilized edges with hammerstones.

The following types of bone tools were found as far: Long cudgel-like chopping tools having fractured edges; light-duty, straight or convex scrapers; up to 80 cm long spalls of elephant long bones showing a retouched edge rounded through plane-like usage (*fig. 35*); scraper-like tools made from rectangular pieces chopped off the ribs; long pieces of ribs whose sharp edges were, as is apparent in the specimens, used for cutting; chisel-like tools made of thick compacta pieces showing facially fractured butts (*fig. 34*);

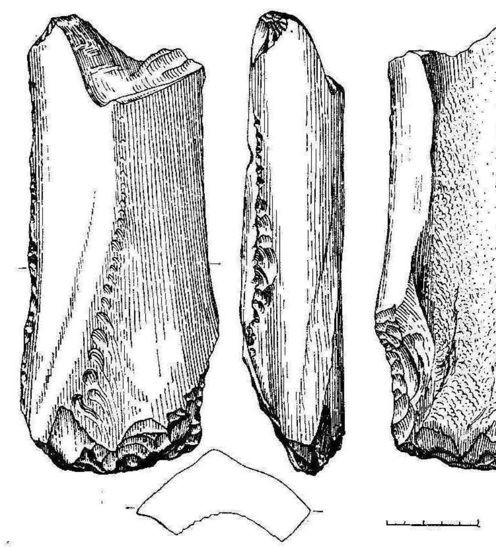


FIGURE 34. *Bilzingsleben. Bone chisel.*

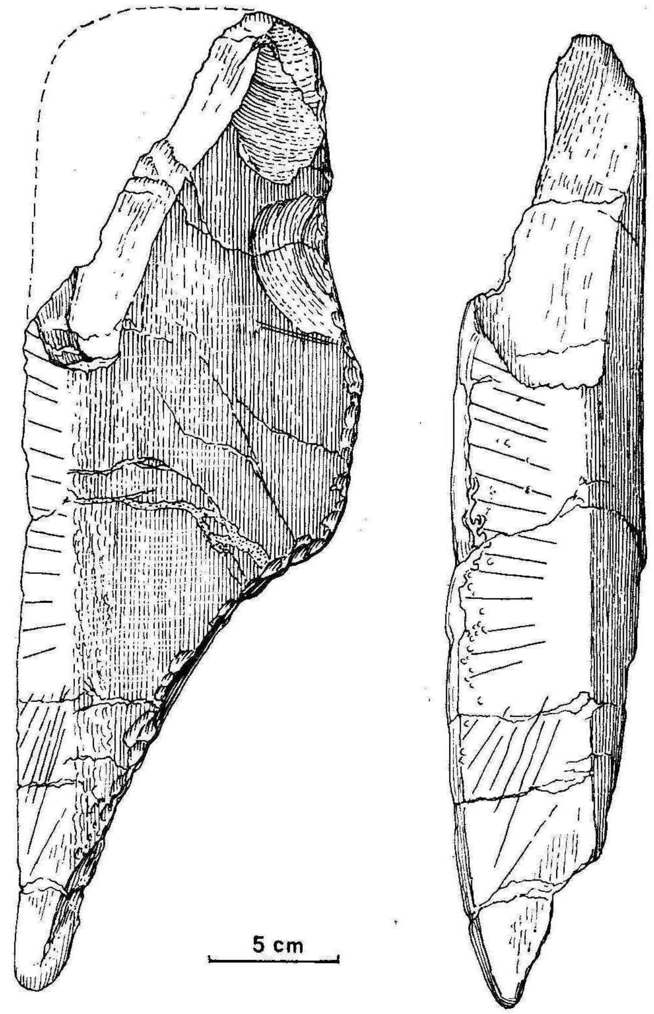


FIGURE 36. *Bilzingsleben. Bone tool bearing deliberate engravings.*

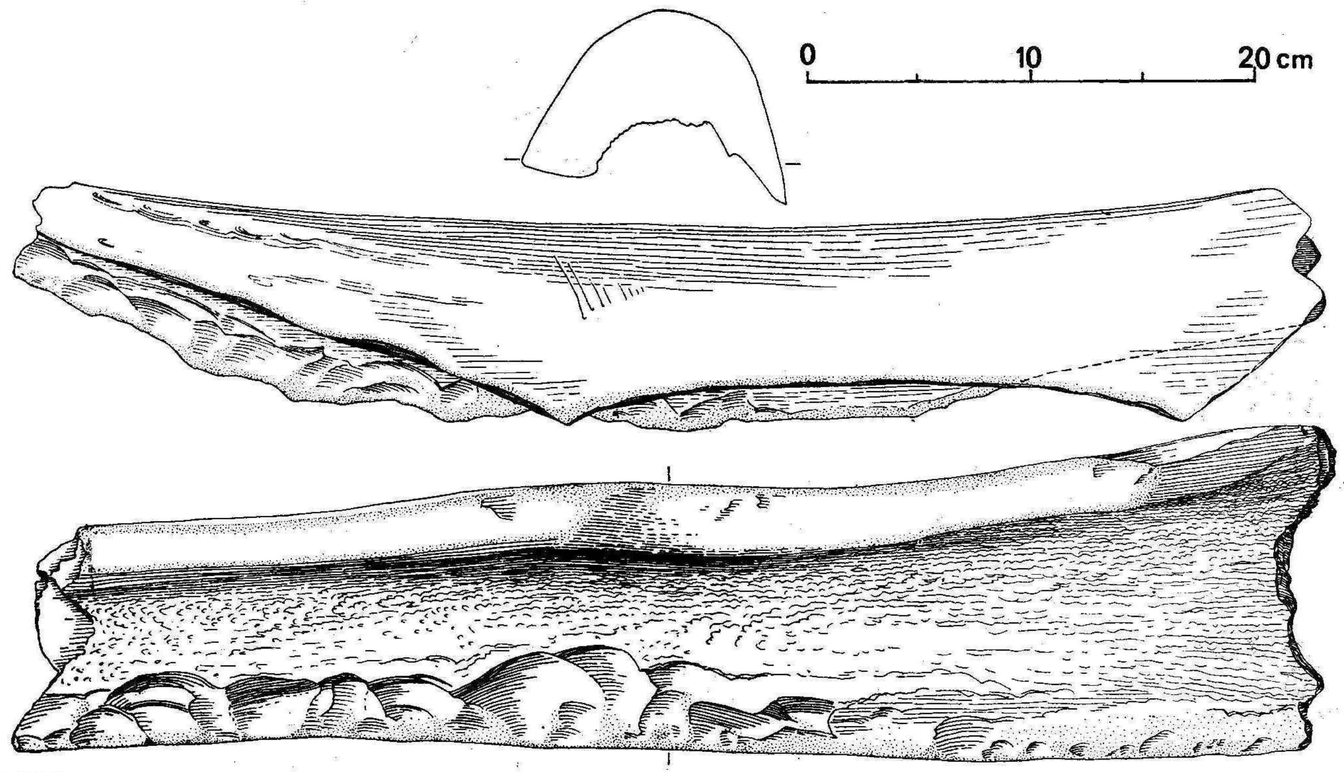


FIGURE 35. *Bilzingsleben. Bone plane.*

hammer-like utilized compacta pieces with broad, fractured and rounded butts; compacta pieces with pointed butts polished by usage; spalls from ulnae of larger mammals showing a fractured pointed distal butt; bodkin-like rounded bone end utilized; anvils bearing marks of banging and battering, and cutting marks on scapulae and ilium bones of large mammals; detached joint heads from humerus or femur of rhinoceros as well as tarsus of elephants showing wear patterns.

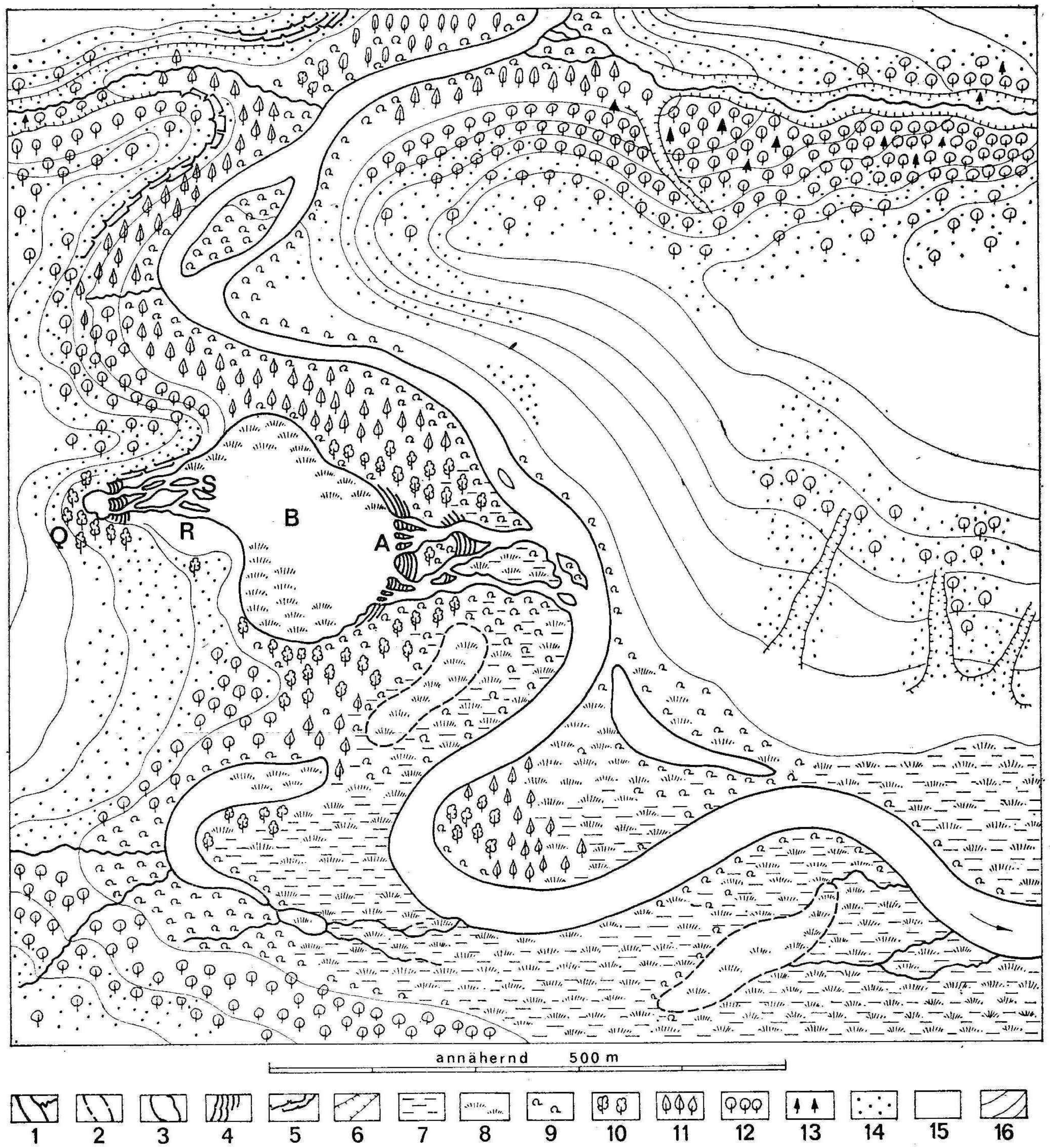


FIGURE 37. *Bilzingsleben: Palaeogeographical map.* 1 *River and brooklets,* 2 *detached river arms grown with Phragmites,* 3 *lakes,* 4 *travertin cascade,* 5 *rocky slopes,* 6 *erosion cracks,* 7 *swamps,* 8 *reed,* 9 *shrubs of willow,* 10 *alder wood,* 11 *swampy wood with alder, ash-trees, poplar,* 12 *dry mixed deciduous forest (Quercetum mixtum, Buxeto-Quercetum with Buxus, hazel, lime-trees, maple),* 13 *yews,* 14 *shrubs (Buxus, Pyracantha, Syringa, Cotoneaster, Cornus Cerasus, Celtis, Berberis, Viburnum, Juniperus, Corylus),* 15 *meadows,* 16 *contour line,* Q *spring,* B *lake,* A *cascade,* R *occupation floor of Homo erectus.*

All these tools can be determined according to their wear patterns. The following traces could so far be recognized.

—roundings, polishings
—scratch lines accumulated in groups
—polish
—facial fractures
—small graduated fractures
—pressure and percussion scars
—scar accumulations
—cutting lines of different intensity.

Furthermore, there are ivory splinters bearing wear patterns on their inner and outer faces. They infer that also tusks were split. As to other artifacts made of ivory they have not yet been evaluated unambiguously.

4.5. *Artifacts bearing deliberate engravings*

Close to the workshops four bone artifacts were found whose smooth surfaces showed regular cutting lines which suggest them not to have been incidental (Behm-Blancke 1983, Mania 1986a). They are deliberately represented constituting the oldest communication of human ideas. The most conspicuous piece is a cudgel made of a 40 cm long spall of a diaphyse of an elephant's tibia (*fig. 36*). One butt is fractured, the other butt is rounded and pointed. The plane, a longitudinal side, 25 cm long and 6 cm wide, bears a rhythmical sequence of regular fan-like lines. The other pieces also show such rhythmical arrangements of lines, divergent and repeatedly composed one after the other. On other objects of bone and ivory as well as on two stone artifacts there are engraved a double rectangle, some double parallel semicircles, a double cross and a semicircle closed up with a straight line. They appear to be signs.

5. THE ECONOMY OF HOMO ERECTUS FROM BILZINGSLEBEN

The artifacts infer knowledge and application of different technologies and working processes of Homo erectus. Furthermore, they indicate implements made of perishable, not preserved material. Many of these technological phenomenons directly correlate with the form of nourishment, i.e. hunting and gathering food. They have not yet been evaluated as far as the economy of the Homo erectus group from Bilzingsleben is concerned, nor have they been archaeologically analysed, e.g. their interrelations on the living floor, expecially within the workshops.

Further important knowledge about the economy of this group can be obtained by the analysis of the food remains of the site preserved (Mania 1983d). Plenty of skeletal remains from large mammals were preserved proving the hunting of big game carried out by Homo erectus this appearing to have been a significant necessity for his existence under temperate climatic conditions. The Bilzingsleben hunting fauna has not yet been completely evaluated statistically so that we can only give some preliminary informations about the economy of hunting.

Rhinoceros present with 27 % had been animals the most frequently hunted. With a long interval they are followed by cerfs, beavers, elephants and bears each represented between 11 % and 18 %. Bovids, wild horses, Trogontherium and smaller predatory animals (fox, badger, wolf, wild cat) are following next each with a frequency of 3—5 %. Lions, roes, pigs and badgers occur each with 1 %. Considering only the largest mammals: rhinoceros, elephants, bovids, wild horses and bears we find out that Homo erectus from Bilzingsleben was evidently hunter of big game about 60 % of these animals constituting his prey. Medium-sized game viz. deers, roes, pigs comprise about 17 % of the total game; small game viz. beavers, small predatory animals are constituting 23 % the beavers (Castor and Trogontherium) covering 20 % because they were a welcome and frequent prey. There are even remains from birds and fish indicating a casual broader diet of Homo erectus. Some remains of egg- and mussel-shells infer that food was also obtained by gathering. Gathered food consisting of plants has not been preserved. But the vegetational remains identified in travertin give us an idea of the plants having been gathered during the favourable season, e.g. hazel-nuts, fruits from Pyracantha, cherries from Cornus mas and Prunus avium, small fruits from Tilia and others.

6. OUR KNOWLEDGE HITHERTO EXISTING ABOUT THE ENVIRONMENT OF HOMO ERECTUS FROM BILZINGSLEBEN

According to geological, geomorphological, palaeontological and palaeoclimatical dates the natural environment of Homo erectus who had inhabited the Thuringian Basin during a Middle Pleistocene interglacial can be reconstructed (Mania 1983e). The Wipper valley had a similar course as it has today. In the region of the "Steinrinne" the bank slope which was 6—8 m steep formed a bay at the foot of which was a travertin spring.

A shallow lake 200×300 m large spread before it with a creek running into it. At this place there was the ideal living-floor for Homo erectus. Here was a flat marginal terrace south of the lake deprived of shore vegetation such as Phragmites, by running water.

The hominids inhabited the diluvial fan of the creek as well as this lake-edge zone. The northern, opposite shore was steep offering but few spots appropriate for occupation. The lake was a stagnant, shallow water rich in plants and surrounded by Phragmites, Salix, swampy meadows as well as by swampy wood. Swampy wood and reed spread, above all, in the Wipper meadows. The bank slope near the living-floor was grown with shrubs and trees.

Plant impressions in hard travertin found in contact with the diluvial fan and lacustrine limestone don't only refer to reed, grass and moss but also to Buxus sempervirens, Pyracantha coccinea, Corylus avellana, Celtis australis, Syringa josikaea, Alnus glutinosa, Acer campestre and Cornus mas. Thus we can get an idea of the occurrence of shrubs and tre having grown near the spring at the bank slope and on the adjacent plateau. On the whole, the environment of the occupation floor was wooded, but there also occurred park-like forests (Buxo-Quercetum pubescentis) and numerous treeless areas interspersed with shrubs and meadows which had been rich in grass vegetation. A temperate climate with higher average temperatures and more precipitations in a year than can be registered in this region today was predominant. The summers were warm and the winters were very mild. But there were some days with frost and snowfall. The landscape offered good life conditions for the large herbivores. The large herds, in turn, attracted numerous predatory animals. The waters were abundant in fish. The abundance of game was an important necessity for the existence of Homo erectus in Central Europe. Furthermore, the mild climate made it possible for man to gather plenty of food during the warmer season consisting of plants and small animals.

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Dr. habil. Dietrich Mania
Landesmuseum für Vorgechischte
Richard Wagner Straße 9—10
4020 HALLE (SAALE)

Dr. Emanuel Vlček, D. Sc.
National Museum
tř. Vítězného února 74
117 21 PRAGUE