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THE DISCOVERY OF A NEANDERTHAL JAWBONE (KŮLNA I) IN KŮLNA CAVE, MORAVIA

ABSTRACT: In this paper, a human maxilla from the Mousterian layer of Kůlna Cave (Moravian Karst, Czech Republic) found in 1965 is presented. The layer was intact and yielded numerous Mousterian-type tools and fossil animal bones. The find is represented by the right part of a maxilla with four teeth (canine, both premolars and the first molar) and belongs to a 14-year-old individual. The find exhibits a series of both primitive and progressive traits. This mixture of traits is typical not only of this find from Kůlna Cave but also of many earlier finds, particularly of those from Central and Eastern Europe and from the Near East. The find from Kůlna Cave provides further evidence of a developmental type of the Neanderthal humans that clearly indicates a continuous transition from older forms to later Homo sapiens sapiens*. The find of a Neanderthal human from Kůlna Cave is designated as* Homo sapiens neanderthalensis*. This article is a reprint of a previously published article (Jelínek J., 1967: Anthropologie (Brno) 5, 1: 3–19).*

KEY WORDS: Kůlna Cave – Moravian Karst – Neanderthals – Homo sapiens sapiens – Homo sapiens neanderthalensis

THE FIND OF A NEANDERTHAL MAXILLA

On July 30, 1965, during excavations in Kůlna Cave (Moravian Karst) (*Figures 1, 2*), a human maxilla was found inside the uppermost Mousterian layer, 29 m from the cave entrance (*Figure 3*). Based on palaeontological and archaeological finds and on stratigraphy, the layer can with certainty be classed with the end of the first Würm stadial (Lower Würm). It was intact and yielded numerous Mousterian-type tools and fossil animal bones. That the jawbone belongs to these finds and to the above-mentioned layer is beyond doubt (for details on topography, conditions at discovery, description of geological section, etc., see, Valoch 1967).

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FIGURE 1. Neanderthal localities in Moravia.

The find is represented by the right part of a maxilla with four teeth still present in alveoli (*Figures 4–7*). The osteological part of the find encompassing the symphysis shows the inferior margin of the piriform aperture; the frontal process is broken off and in the area of sinus where the bone is relatively weak the external bone layer was broken through so that the jawbone did not remain preserved here as far as the inferior margin of the orbit but only to about half of this distance. The alveolar process is complete, preserved from the symphysis as far as the first molar. The bone is broken off here so that the rest of the maxillary arch is not preserved. Looking at the palate we can see that the frontal part of the symphysis (suture) is present, whereas the dorsal part is broken off against the alveolus of the second molar. The maxillary foramen is not preserved. Canine, both premolars and the first molar remain *in situ*. All of them belong to permanent dentition and are only little abraded so that they provide ideal material for study. From both of the incisors only empty alveoli are preserved. The dental crowns exhibit bluish spots caused by minerals contained in the teeth. Macroscopically, it can be seen that the bone is well fossilised. Its colour corresponds to that of all the other faunal skeletal remains found within the same layer.

Between the tips of the roots of the second incisor and the canine there is a small foramen on the surface of the bone, which is, however, of no special importance.

As a measure of the height of the maxilla from Kůlna Cave we can use the prosthion-nasospinale distance, which is here 29.0 mm. This distance is relatively well measurable, even though the anterior nasal spine and the prosthion are slightly damaged. Compared to other Neanderthal skulls it is evident that the jawbone from Kůlna Cave stands out for its height. Its anterior nasal spine – if developed at all – was very indistinct. The inferior margin of the piriform aperture is bordered with

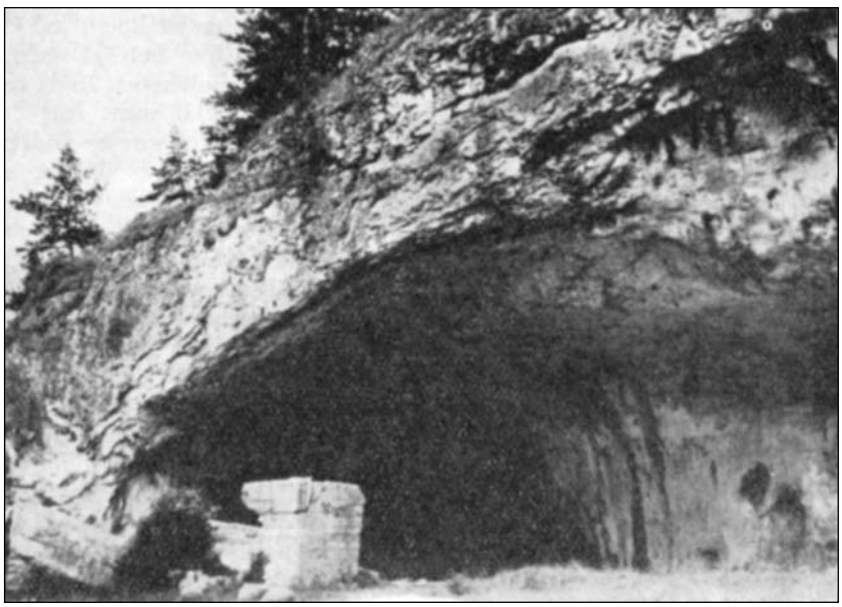

FIGURE 2. Kůlna Cave, before the excavations.

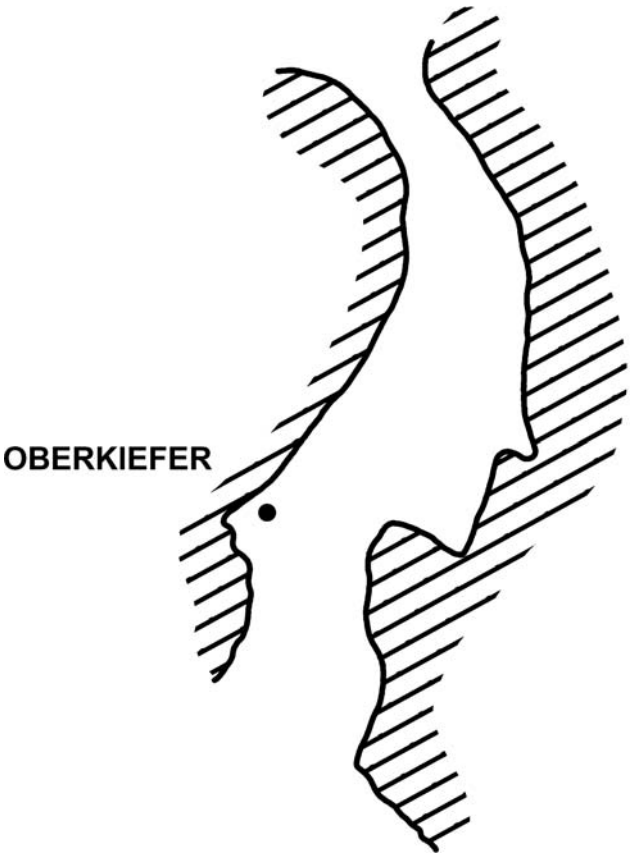

FIGURE 3. Ground plan of Kůlna Cave with the location of the maxilla find highlighted.

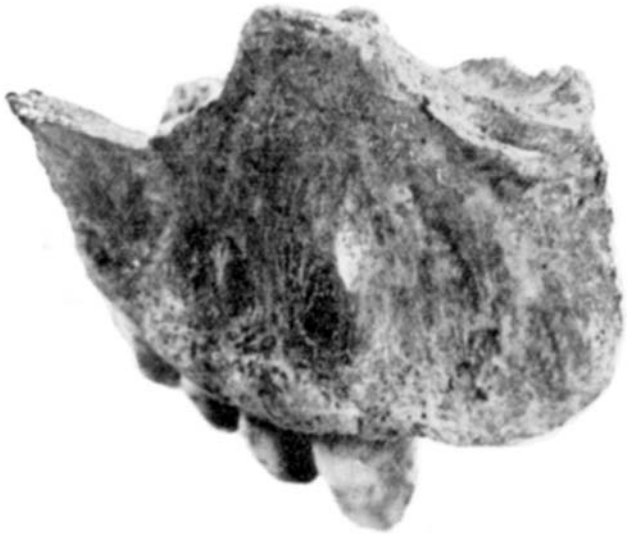

FIGURE 4. The Neanderthal jaw from Kůlna Cave with a canine, both premolars, and the first molar.

a narrow but deep pre-nasal fossa, which is shifted towards the inside of the nasal cavity. Its external margin is only a little lower than the internal margin so that the structure is reminiscent of a double maxillary crest (*crista maxillaris* after Holl, *crista anterior* after von Bonin). According to the scheme by Hovorka, this constellation corresponds best to an infantile form. Both the external and internal crest (*crista anterior* and *posterior* after Bonin, or *crista maxillaris* and *intermaxillaris* after Holl) run almost parallel one to the other. As already mentioned, the anterior crest (*crista anterior*, *crista maxillaris*) is a little lower and sharper. The fossa is narrow and deep. The posterior crest (*crista posterior*, *crista intermaxillaris*) is less sharp and doubled again in the medial part against the nasospinale (*Figure 4*).

Many authors consider the existence of the nasal spine a human-like trait associated to a certain degree with the incidence of orthognathy. Hamy (1869: 5) declares that the nasal spine occurs with orthognathic skulls, grows smaller with increasing prognathism and is entirely missing in several "inferior" races. For this reason, it is most frequent with Europeans and with them it also reaches the most distinctive stage of development. Until now, the absent or very weakly developed anterior nasal spine in the jawbone from Kůlna has been considered a primitive trait. This is, however, in contradiction to the incidence of a markedly developed anterior nasal spine in several Neanderthal skulls.

The morphology of maxilla in Neanderthal finds is very varied. In the typical find from La Chapelle aux Saints we can observe a well-developed anterior nasal spine, the maxilla is high but without the pre-nasal fossa. Its height on the right side, where the alveolar process is better preserved, is 25.5 mm or 29.0 mm inclusive of the nasal spine respectively. From La Ferrassie, the maxillae of only two individuals remained preserved. La Ferrassie I is a little damaged so that the area of anterior nasal spine is not preserved. We can, however, observe a weakly-developed pre-nasal fossa. The find indicates that this maxilla was not very high. Unfortunately, no metric values could be obtained. La Ferrassie II represents a part of the right side of a maxilla including the second incisor, the canine, both premolars and the first molar preserved *in situ*. Pre-nasal fossa is visible on the preserved part of the inferior nasal margin in both of the above finds, La Ferrassie I and II. The Palestinian find Kafzeh VI bears a doubled medium-sized anterior nasal spine. The edge of the nasal aperture, however, is plain, without the fossa. The prosthion-nasospinale height is 22.5 mm or 23.5 mm

FIGURE 5. The jaw from Kůlna in occlusal view.

FIGURE 6. The jaw from Kůlna in occlusal view. This figure was in Jelínek (1967) labelled as Fig. 7.

inclusive of the nasal spine respectively. Here, it is a relatively low jawbone (I could study this find by special courtesy of Prof. H. Vallois, director of the Institut de Paléontologie Humaine, Paris).

In connection with the find from Krapina, Gorjanović-Kramberger (1906) described the whole situation and distinguished two types of the jaw height: a low and a high one. The high type was assigned by him to the maxilla from Spy, which was known by that time, and the lower type then to Krapina C where he found out that both these maxillary types are linked through many transitional forms. To the low type of maxilla C, having a prosthion-nasospinale height of 21 mm, he also assigned with certain possibility the maxilla P, in which the relevant height could not be measured but the find was evidently not very high.

According to Gorjanović-Kramberger (1906), the jaw E was 27.7 mm and jaw F about 24.7 mm high. These two values show at first sight that there can hardly be two types among the sparse material; these "types" are rather to be considered marginal values of the range of variation of all the cases available for study. The low jaw C bears deep wide pre-nasal fossae whose similar form, however, can also be observed in high jaws. The anterior part of the jaw from La Quina, including prosthion and nasospinale, is damaged. In addition, the alveolar process is a little reduced. The present prosthion-nasospinale height is 23.0 mm, which means that the jaw must have once been much higher when the alveolar process was still complete. The prosthion-nasospinale height in Spy I was measured to be 28 mm. As far as the maxilla from Monsempron is concerned, Vallois (Coulonges *et al.* 1952) declares that it hardly could have had a nasal spine. This feature is regarded by many authors as a typical attribute of Neanderthals, which stems from the picture of classical Western European Neanderthals based on both of the well-preserved finds from La Chapelle and Gibraltar. The fact that the nasal spine in these individuals was markedly developed of course does not imply that this trait is typical of all Neanderthals or even especially of the Western European Neanderthals.

The Neanderthal skull from La Quina bears a well-developed nasal spine, the same as the above-mentioned skull from Kafzeh in Palestine and the Italian find Saccopastore I. As far as the Palestinian finds from Skhul and Tabun are concerned, in Skhul IV we can observe a strong and blunt anterior nasal spine. The fossa in the front is faintly delimited and its internal crest is sharp. The external edge can be followed up only in the lateral and medial part. It is interesting that this skull does not exhibit any sub-nasal prognathism. The prosthion-nasospinale height is 29.5 mm, which indicates a relatively very high jaw compared to the height of 29.3 mm in La Chapelle aux Saints and 29.1 mm in Gibraltar. The skull from Skhul V, on the other hand, bears a markedly prominent facial skeleton inclusive of

the teeth so that the facial angle of 74.5° is fairly low compared to the data given by McCown and for Gibraltar (88°), La Chapelle aux Saints (82°), Předmostí (86°), Cromagnon (83°) and a recent Australian (80.5°). This jaw (Skhul V) does not exhibit any sub-nasal prognathism, either. The skull Tabun I, on the other hand, shows a facial angle of 92.0° which means that it is distinctly orthognathic. Its nasion-nasospinale height is 21.0 mm but the anterior nasal spine is not developed, despite the otherwise very strong morphological similarity to the Gibraltar skull.

As far as this can be judged from the published finds, it seems that the inferior margin of the nasal aperture is mostly doubled. In the skull from Gibraltar, by contrast, it is very sharp and plain.

In the African skull from Broken Hill, the whole facial skeleton remained preserved and here also, a very well-developed anterior nasal spine can be observed. The inferior margin of the piriform aperture indicates an orygmocraspidic type. The edge is laterally doubled but does not form any pre-nasal fossa. The prosthion-nasospinale height in this skull is extremely large (37.0 mm), which represents the highest value ever detected in humans.

This overview of the known finds shows clearly that even though the maxillary height in several Neanderthal finds is much larger than the mean value in modern humans, it does in no way represent a characteristic feature of all Neanderthal finds, not even of the so-called classical Western European Neanderthals. Considerable differences in this regard exist not only in finds from different localities but, as is evident from Krapina, also within one and the same locality. The incidence of anterior nasal spine cannot be considered a characteristic trait, either, and the morphology of the inferior margin of the nasal aperture in Neanderthals turned out to be very varied.

From the first and second incisor of the jaw from Kůlna Cave remained only empty alveoli. The teeth themselves are not preserved. The alveolus of the second incisor is oval in shape, moderately flattened on the lateral side, so it is not circular as is usual with recent teeth. It is 18 mm deep and its sagittal and transverse diameter is 8.9 mm and 7.0 mm respectively. The alveolus thus stands out for both dimensions and shape. Also the difference in size against the alveolus of the first incisor is smaller than in present-day dentition. The alveolus of the first incisor was unfortunately partly damaged on the mesial wall so that only the sagittal diameter (8.0 mm) and the depth (19.0 mm) could be reliably measured. The alveolus thus indicates a strong dental root but its dimensions are in no way exceptional compared to the dentition of modern humans. The well-preserved symphysis refers to a subadult individual. The overall morphology reveals that the jaw was only slightly prognathic. The alveolar process is thickened on the buccal side mainly at the canines, both premolars and the first molar, and it forms here even an extended bone lip. The dental necks are exposed, most distinctly in the molar in which the upper part of the root is clearly visible on both the buccal and lingual side. Mesially and distally, the bone does not reach here to the roots and forms some "pockets" around so that the roots are exposed up to 2–3 mm (*Figure 10*). This effect is undoubtedly caused by some pathological process.

The bone is broken off in the alveolus of the second molar so that only its mesial wall can be observed. The alveolus and the tooth were evidently relatively wide, with dental roots diverging both buccally and lingually. In this alveolus, the pathological loosening of dental root was already not so strong as it was with the first molar.

The palate is deep and shows numerous wrinkles and bumps. It extends slantwise from the incisor and falls steeply down from the molar. The maxillary foramen was doubled and medium-sized.

The dentition forms a relatively even horseshoe-shaped arch; individual teeth are placed side by side so that no free space is left between both of the incisors, the second incisor and the canine, and between the canine and the premolar. The external outline of the alveolar process is angular in shape, as if it were slightly bent at the canine. From this finding, however, no phylogenetic conclusion can be drawn about the shape of the upper maxillary arch because it is probably the result of the same pathological process, which has markedly affected the alveolar arch. The dental arch itself is much more rounded, which becomes apparent if the preserved part of the maxilla is supplemented with its hypothetical counterpart. The anterior part of the dental arch then turns out to be much more horseshoe-shaped. Judging from the preserved part of the jaw, the lateral portions of the alveolar process including the molars obviously ran parallel to each other. The total width of the palate was small, based on the distance between both the canines and molars.

CANINE

The canine of the jaw from Kůlna Cave is relatively large compared to the adjacent teeth (P^1, P^2, M^1) and exceeds them by 1.5–2.0 mm. This finding, however, is

in no way extraordinary in neither fossil nor recent dentitions. Thanks to the overall height of its crown, this tooth looks as if it were much higher than the adjacent teeth. Its cusp is already considerably eroded. Abrasion affected the entire occlusal margin of the crown and is somewhat stronger mesially than distally, whereby the mesial part of the crest is abraded to a horizontal facet. This tooth was originally probably even higher and its cusp was asymmetrical. The buccal surface of the crown is distinctly convex and stands out for its height rather than width. Its upper part bears indistinct indication of one central and two lateral tips. The mesial surface of the tooth is more plane than the distal one, and the latter is narrower at the neck than at the crown. From a lingual view we can see a distinct medium-sized lingual tubercle, which is shifted a little asymmetrically to the mesial side. From its distal margin approximately over the middle of the lingual surface of the crown as far as the apex extends a groove, which however, does not reach the occlusal margin of the tooth. From the mesial margin of the lingual tubercle a second groove extends and forms the distal border of the marginal ridge of the crown (mesial crown margin). On the distal part of the lingual surface there is a depression next to the distal corner. Between this depression and the crown margin there is a residue of the distal marginal ridge; between the depression and the central groove lies the distal marginal crest extending up to the upper margin of the tooth; between the central and mesial groove lies the mesial crest. In the mesial direction from the mesial groove is the mesial marginal ridge. The morphology of the crown is typically caniniform. The lingual tubercle is too small to give the tooth a premolariform character, and incisiform tendencies cannot be identified, either. The occlusal surface of the tooth is oriented horizontally, but this is to be regarded as an effect of the beginning of abrasion. The oval is interesting, being laterally quite flattened with a moderately curved root. Even though the tooth cannot be removed from the alveolus, it is possible to follow up the course and length of its root at least partly where the bone defect exposes its anterior crest. The rest is then visible on an X-ray image (*Figure 7*), according to which the dental root is relatively long but does not go beyond the metric range of variation of the recent canines. It moves within the upper part of this range of variation and represents a below-average value among the other Neanderthal teeth.

In recent humans, we can observe that the non-abraded upper crest of the crown is shorter mesially and longer distally. The corners at which the occlusal and lateral crests come into contact are of different height and

FIGURE 7. An X-ray image of the jaw from Kůlna. This figure was in Jelínek (1967) labelled as Fig. 6.

unequally distinctive. The distal corner is higher and flatter, while the mesial corner is lower and more distinctively formed. The same was probably also the case with the canine from Kůlna Cave before it began to be abraded. The abrasion of its occlusal surface is not yet so advanced that it could not be observed. The lingual tubercle in recent canines – if present at all – is usually less distinct than with the incisors. The root is mostly in average 25 mm long, laterally compressed, equipped with lateral grooves, slightly curved and distally bent. The distal side of the root is usually arched more strongly than the mesial side. The root is slightly oval in cross-section. In these characteristics also, the canine from Kůlna Cave finds morphological analogies; non-abraded maxillary canines of the Neanderthals are known from Le Moustier, Krapina, Monsempron, Kafzeh, Skhul, Tabun, and Spy.

The jaw from Mauer shows that morphological development did not proceed straightforward and simply, not even in individual teeth. It could understandably be supposed that in this archaic jaw at least the canines would exhibit archaic traits. However, these canines are modern not only in their size but also height and thickness of the crown and do not differ in any way from the canines of modern humans. Thus, when primitive characteristics of the canines are detected in some later Neanderthal finds, they seem rather to indicate an unequal tempo and direction of development.

Le Moustier bears a relatively distinct lingual tubercle on the maxillary canine, but the tooth is not very

wide and shows a well-formed lateral topography. The lingual tubercle is part of the basal cingulum, which is separated from the marginal crests on both sides by deep grooves. W. K. Gregory described this canine to be morphologically similar to the bicuspid type. Its root is curved, but less than that of the adjacent incisor. The aforesaid premolarisation of this canine, however, does not exhibit any truly Neanderthaloid features because we can identify this phenomenon (not only sporadically) in recent humans as well (de Jonge-Cohen 1928, Weidenreich 1937). Compared to the other teeth, the above-mentioned canine from Le Moustier is distinctly higher. However, in modern populations, too, canines sometimes distinctly overtop the premolars (e.g. Sarasin 1916–1922, in New Caledonians and people from the Loyalty Islands, in whom the canine sometimes exceeds the neighbouring teeth by 2–3 mm). Pedersen (1949) also gives a similar example with an Eskimo. The basal ridge also is a trait, which is sometimes observed with Central European populations, e.g. the Germans and Hungarians.

Krapina K bears a relatively strong maxillary canine, which in the morphology of its lingual side is reminiscent of the canine from Le Moustier. Its lingual tubercle is distinct and resembles an incisor rather than a premolar. Another maxillary canine from Krapina (Gorjanović-Kramberger 1906: 191, Tab. I, Fig. 4) has a laterally flattened root; its lingual tubercle is large and has the form of a fold with strong marginal ridges. On the lingual surface of this canine five similar folds can be observed. According to Hrdlička (1930), the canines from Krapina are indented on the lingual side and approximate the shovel-type, in which the lingual surface is divided by a vertical ridge or fold. The roots of canines from Krapina are said to be short, which should be associated with absent canine fossa. The large variability of the root length in canines of modern humans, however, begs us to be careful in drawing conclusions.

In La Quina, we find a 31 mm long strongly abraded canine on the right side of the maxilla. Its original length was, according to Siffre (1908), 36 mm (according to Black, this length in modern humans is 32 mm) (*Table 1, Figure 8*). This corresponds to the maximum detected in the Krapina finds. The length of the maxillary canine from Kůlna Cave is 31.5 mm. Thus, it is clear that it does not reach the maximum dimensions of Neanderthal teeth but falls rather within the maximum dimensions

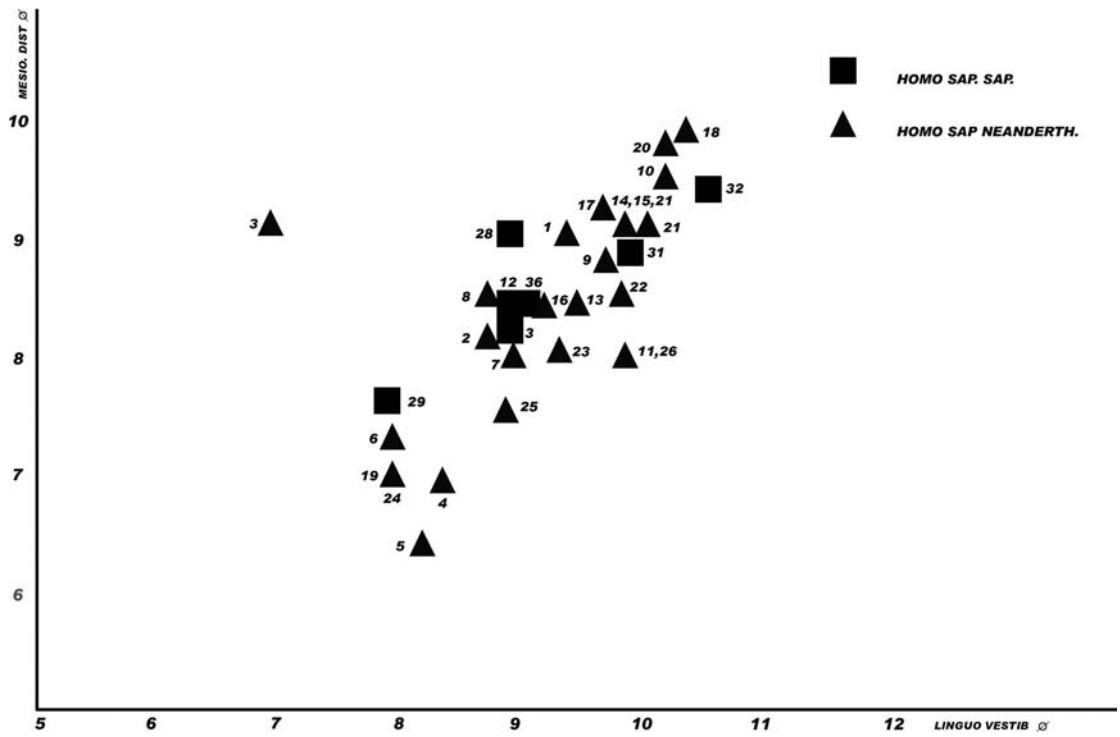

FIGURE 8. A correlation between the mesio-distal and linguo-vestibular diameter of the canines. The numbers represent individual localities (see, *Table 1*). This figure was in Jelínek (1967) labelled as Graf 1.

TABLE 1. Dimensions of the canines in *Homo sapiens neanderthalensis* and *Homo sapiens sapiens*.

			Mesiodistal diameter	Buccolingual diameter	Height	Index	Length
1	Monsempron		9.0	9.5	11.0	99.4	33.0
2	Tabun 2 s.		8.1	8.8	6.8	92.0	30.6
3	Skhul X		9.1	7.0	12.0	130.0	
4	Skhul II		6.9	8.4	5.7	78.0	20.0
5	Skhul II		6.4	8.2	5.5	82.1	20.0
6	Skhul IV		7.3	8.0	9.5	91.2	25.0
7	Skhul V		8.0	9.0	8.4	88.8	26.5
8	Skhul, $N = 5$	Mean	8.4	8.9		94.4	
9	Kafzeh 6		9.0; 8.5	9.8; 10.0			
10	Krapina (Mc Cown)		9.5	10.3		92.2	
11	Kafzeh 7		8.0	10.0		80.0	
12	Australian (Campbell)		8.4	9.0		107.1	
13	Kůlna		8.4	9.6	11.7	87.5	31.7
14	Le Moustier (Klaatsch 1909)	Right	9.0	10.0		90.0	
15	Le Moustier (Klaatsch 1909)	Left	9.0	10.0		90.0	
16	Krapina (Gorjanović-Kramberger 1901)	Min	8.4	9.3		90.3	
17	Krapina (Gorjanović-Kramberger 1901)	Mean	9.1	9.9		92.6	
18	Krapina (Gorjanović-Kramberger 1901)	Max	9.8	10.5		93.3	
19	La Ferrassie		(7.0)	(8.0)			
20	Krapina		9.0–10.5	9.3–11.3	10.4–12.6	71.0	25.6
21	La Quina (Martin 1923)	Right	9.0	10.0	10.5 + X	90.0	
22	La Quina (Martin 1923)	Left	8.5	10.0	10 + X	85.0	
23	La Quina 1926		8.0	9.5	10.3 + X	84.3	29.3 + 5
24	Spy I (Fraipont, Lohest)	Right	7.0	8.0	6.0 + X	87.5	
25	Spy I (Fraipont, Lohest)	Left	7.5	9.0		83.3	
26	Spy II (Fraipont, Lohest)		8.0	10.0	7.5–8.0 + X		
26	Spy II (Fraipont, Lohest)		8.0	10.0		80.0	.
27	Neanderthals (Patte)	Mean	8.9	10.1		88.7	
28	Recent human (Black)	Max	9.0	9.0	12.0	100.0	32.0
29	Recent human (Black)	Mean	7.6	8.0	9.5	95.0	26.5
30	Recent human (de Jonge-Cohen 1928)	Mean			10.9		
31	Recent human (Choquet)	Max			14.0 Mongolian		
32	Recent human (de Terra 1905)		9.3	10.8	13.5 German	86.1	32.0 China, Europa
33	Recent Loyalty Islands, $N = 36$ (Sarrasin)	Max	7.0–9.7	7.5–10.0	13.5 + X		
34	Recent Loyalty Islands, $N = 36$ (Sarrasin)	Mean	8.3	9.0		92.3	
35	Recent New Caledonian, $N = 44$ (Sarrasin)	Max	7.5–9.0	8.0–10.7	13.0 + X		
36	Recent New Caledonian, $N = 44$ (Sarrasin)	Mean	8.4	9.05		92.8	
37	Australian (de Terra 1905)	Max	9.0	10.1	11.0	89.1	

observed with modern humans. Even though in La Quina, it is a hypothetical reconstruction of the length of this tooth, it is interesting that it is essentially equal to the maximum values detected in modern humans. The vestibular surface of this tooth is markedly arched. The neck also is well-formed and the crown extension begins only higher over the dental neck, which is a trait also observed with some canines from Krapina, several recent Australians, etc. The root is mesio-distally flattened, whereas in recent teeth it is mostly triangular. In the find from La Quina, individual traits are quite distinctly formed. Similar to recent teeth, the mesial surface is more even than the distal one.

In 1926, another isolated canine was found at the La Quina site. Its mesial side of the crown is relatively well arched. It still bears remnants of the lingual tubercle and of three small bumps which divide the lingual surface of the crown. The root bears a distinct groove on both mesial and distal side, which indicates a tendency to root furcation; the X-ray image shows two root canals but the root itself is not doubled.

According to Hrdlička (1930: 166), the canines of the Gibraltar find resemble very much the premolars but are not larger than the latter.

As far as the Spy I canines are concerned, they exhibit well-arched vestibular surfaces. In the Monsempron find, a three-part lingual tubercle can be observed, from whose central tip a ridge extends to the upper margin of the crown.

The canine from Tabun shows a very well developed cingulum, which runs upwards bordered with strong ridges on both margins. It is shorter distally than mesially. On the inner surface of the teeth, two indistinct upthrusting ridges can be observed. This tooth, on the whole, is distinctly shovel-shaped and finds analogies in the canines from Krapina, above all with regard to their marginal ridges. The lingual surface, however, lacks any traces of the upthrusting ridges. In Skhul IV, the left maxillary canine is preserved which is heavily worn but evidently premolariform in shape.

The maximum width detected in Neanderthal canines is 10.5 mm (Krapina), which apparently exceeds the same value in modern humans (9.75 mm, after Sarrasin in the New Caledonians). The smallest width – 7 mm in the canine of Spy I – approaches the mean value in modern humans (7.6 mm after Black). The linguo-vestibular diameter in Krapina reaches 11.3 mm and exceeds not only the maximum in modern humans (10.75 mm, in the New Caledoninas 10.8 mm after de Terra 1905) but also the value of the canine from Talgai. The value from Krapina is only exceeded by the canine from Cohuna, which is 12.5 mm wide. The lowest value (8 mm) corresponds to the average in modern humans (Black). The largest crown height of 15.5 mm was measured in the La Quina canine and outreaches all of the hitherto known height dimensions of Neanderthal canines inclusive of the Australian find from Talgai (14.5 mm). The crown height from Krapina (12.5 mm) shows that these teeth stand out for their thickness rather than height. The tooth width corresponds to present maximum of the Europeans, the thickness to the values measured in people from the Loyalty Islands. The width dimensions also correspond to the Australians studied by de Terra (1905). The canine from La Quina, however, notably stands out for its crown height. The lowest heights of Neanderthal canine crowns are not smaller than the mean values of modern population (Black). Black and de Terra (1905) relate that the maximum total height of the maxillary canine in modern humans would be 32 mm. This value is considerably exceeded by the Neanderthal canines (Krapina 36 mm). The height of the canine from Kůlna Cave is only 31.5 mm but the original total height before abrasion may have been 32 to 33 mm. The canine from Monsempron is wide and the crown is untapered almost as far as to the dental neck. The vestibular side is well arched. On the lingual side there is a low and wide central ridge so that both of the lateral depressions are reduced to shallow grooves. The lateral crests are distinctly formed. At the beginning of the aforesaid central ridge is a distinct small tubercle. The dental cusp is slightly abraded and moderately exceeds the level of the incisors.

The comparisons performed show clearly that the canines of modern humans are very similar to those of the Neanderthals. The latter are absolutely and relatively larger and higher compared to the canines of modern humans but much narrower at the crown and root compared to Sinanthropus. The tip of the crown overtops the other teeth mostly only a little. Neanderthal canines exhibit a considerable variability of the developmental stage and frequency in most of their traits.

PREMOLARS

In the first premolar from Kůlna Cave (*Figures 5, 6, 9*) we can observe a slightly indicated swelling, probably a residue of the cingulum, running parallel to the alveolar process on the buccal and lingual side on the lower part of the crown. In the finds from Kůlna, no augmentation of grooves can be observed on the occlusal surface of the premolars or their molarisation. The occlusal pattern

FIGURE 9. Occlusal morphology of the teeth. This figure was in Jelínek (1967) labelled as Fig. 8.

consists of two small tubercles, from which the buccal one is a little higher and takes more area than the lingual one, as is usual with most fossil and recent teeth. The molar tubercle is not present. In the find from La Chapelle aux Saints we can see that the alveolus of the first premolar was divided into two halves and that the second premolar had two distinctly formed strong roots. Gorjanović-Kramberger (1906) relates that the first and second premolars from Krapina had always two separated or connected roots. In the Monsempron find, too, at least the end of the root is bifurcated. This trait,

TABLE 2. Dimensions of the first premolars in *Homo sapiens neanderthalensis* and *Homo sapiens sapiens*.

			Mesiodistal diameter	Buccolingual diameter	Height	Index	Length
1	Le Moustier (Klaatsch 1909)	Right	8.0	10.5		76.1	
2	Le Moustier (Klaatsch 1909)	Left	8.0	10.5		76.1	
3	Krapina (Gorjanović-Kramberger 1906)		8.0–8.2	11.3–11.4	8–10.1	71.0	25.6
4	La Quina	Right	8.3	11.2	5.5–8.5	74.1	
5	La Quina	Left	9.0	11.0	7.0	81.9	
6	Spy I		7.0	9.5–10.0	5.5–6.6		
7	Spy II		7.5	10.5	70	71.4	
8	Kůlna		7.4	9.8	8.1	75.5	24.9
9	Monsempron		8.0	11.0	9.0	72.7	28.0
10	Kafzeh 6		7.3	10.5		69.5	
11	Kafzeh 7		7.0	10.0		70.0	
12	Tabun		7.5	9.8	7.0	76.5	(21.0)
13	Neanderthals	Mean	8.0	10.8	6.0 int. 7.0 ext.	74.0	
14	Recent human (de Jonge, Cohen 1928)				7.5 int. 8.7 ext.		
15	Recent human, Javanese (Choquet)	Max			19.6		
14	Recent human (Black)	Min	7.0	8.0	7.0	87.5	
15	Recent human (Black)	Mean	7.2	9.0	8.2	80.0	
16	Recent human (Black)	Max	8.0	10.0	9.0	80.0	
17	Recent Timor Isl. (de Terra 1905)		8.7	12.5	9.0	69.9	
18	Recent human Burma (de Terra 1905)		8.5	10.8		78.7	
19	Recent Papuan (de Terra 1905)		7.8	11.4	9.5	68.4	
20	Recent Australian (de Terra 1905)		8.0	11.2	9.0	78.4	
21	Skhul II		5.8	7.7	4.4	75.3	18.6
22	Skhul IV		7.2	8.0	5.2	90.0	(19.5)
23	Skhul V		8.2	9.2	4.4	89.1	(19.5)
24	Skhul VI		12.2	11.0	5.4	110.9	
25	Recent human (Mühlreiter)		6.5–8.0	7.5–10.0	5.0–10.8		16.2–28.2
26	La Ferrassie I		(5.5)	(9.0)		61.1	
27	La Ferrassie II		6.5	12.0		54.1	

however, the same as many other characteristics, underwent substantial changes and its significance therefore should not be overestimated. In present-day populations we find many simple but also double roots. La Quina has two roots which are connected along almost their whole length. Only the root tips are free.

The first premolars from Le Moustier do not show any special traits of the occlusal pattern. The molar tubercle is weakly developed. It is a small bump on the buccal surface of the crown, which lies mesially. It can be observed only in several fossil finds and also in recent humans, even though weakly developed. In fossil finds, we sometimes observe a rest of three depressions on the occlusal surface (Krapina). In the premolars from Kůlna Cave only two typical depressions are developed. As far as the measured values are concerned, the mesio-distal diameter in the Neanderthals corresponds to the maximum value in modern humans, and the minimum value in the Neanderthals usually exceeds the mean value in modern humans. An exception is represented only by the Spy I find, which stands out for a particularly small dentition. The first premolar from Kůlna Cave also lies distinctly below the average of the Neanderthals but exceeds the average of modern humans (*Table 2, Figure 10*). Its mesio-distal diameter of 7.4 mm is, after Spy I, so far the second smallest measure obtained from the Neanderthals. It is interesting that the maximum values measured in the Neanderthals (La Quina 9 mm) are not very distant from those of modern humans. The linguo-vestibular diameter in Krapina reaches the maximum value of 11.4 m. The maximum values in modern humans are also around 11.4 mm and are sometimes even higher.

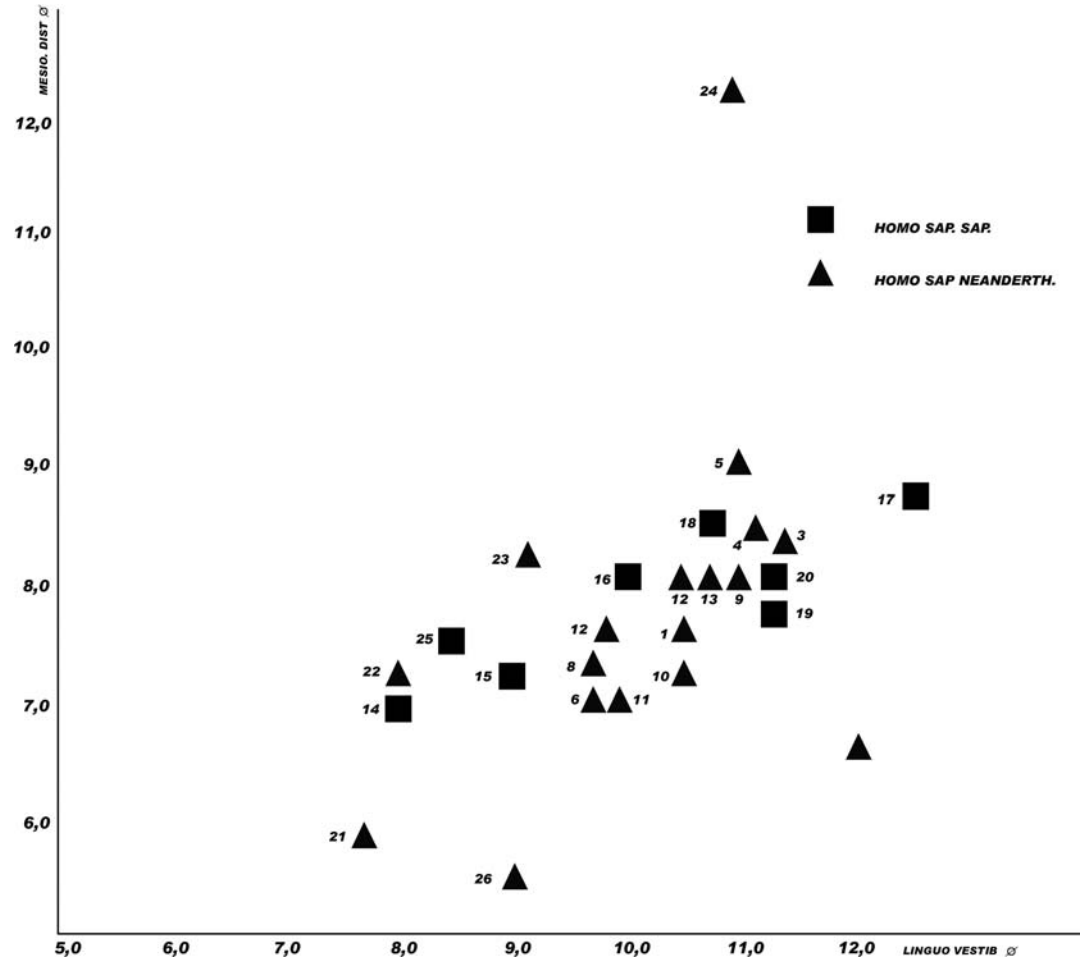

FIGURE 10. A correlation between the mesio-distal and linguo-vestibular diameter of the first premolars (see, *Table 2*). This figure was in Jelínek (1967) labelled as Graf 2.

This also means that the maximum values of this measurement in Neanderthals do not go beyond the range of variation in modern humans. The linguo-vestibular diameter of 9.8 mm of the first premolar from Kůlna Cave is again much smaller than the average value in the Neanderthals and is not very distant from the lowest value measured in Spy I. The height of the almost completely preserved crown in the Kůlna find is approximately the same as the mean value in modern humans.

The measured values of maxillary premolars in Tabun I are within the smallest measures of all among the Neanderthal finds. Even though the occlusal pattern of the second premolar is relatively well-sculptured, it lags far behind the rugged relief observed with some premolars from Krapina. The buccal tubercle is there – the same way as in the find from Kůlna Cave – somewhat larger and higher than the lingual tubercle. Whereas in the first premolar from Tabun I, two parallel ridges run out from the lingual tubercle towards the middle of the occlusal surface, in the Kůlna find only a single ridge can be observed as is the case with the most premolars of modern humans. In the second premolar from Tabun I and even more markedly in the second premolar from Kůlna, the distal marginal ridges of the lingual and buccal tubercles tend to form a sort of depression at their contact point, corresponding to the posterior fovea of some molars. In the second premolar from Kůlna Cave, from the lingual tubercle a crest extends a little slantedly towards the middle, probably corresponding to the crest running out from the protocone in molars which forms a part of *crista obliqua*.

In general, premolars of the Neanderthals differ from those of modern humans above all in their dimensions. The mesio-distal mean values exceed the values in modern humans but not their maximums. For modern humans were sporadically recorded higher values than the maximums reported by Black (see the table). The diameter of the linguo-vestibular cross-section exceeds the maximums given by Black for recent humans, but not the maximums of modern humans declared by other authors (e.g. Klaatsch 1909). As far as the occlusal surface of the second premolars and its grooving are concerned, on the distal part of the crown of the Kůlna find we can observe a somewhat complicated pattern, that is a tendency which is not unusual with modern humans either. However, it does by far not reach such a degree of augmentation as is known with some other Neanderthal premolars.

In general it can be concluded that the both premolars from Kůlna Cave (P^1, P^2) do not differ from the teeth of modern humans in neither size nor shape. The premolars of recent humans normally have two cusps – a large buccal and a smaller and lower lingual one. In the second maxillary premolars, both these eminences can be of equal size. They are separated from each other by a mesio-distal groove and are interconnected by a marginal ridge at the front and back. The root usually bears a deep groove and is divided into a buccal and a lingual branch. The crown of the first premolar is usually oval or trapezoidal (more frequent) in cross-section. The adjacent surfaces of the cusps often exhibit a central or lateral crest and are interconnected by well-developed marginal ridges. The apex of the buccal surface lies in the middle and both of the occlusal crests are of equal size. The mesial corner is situated more lingually than the distal one. The lingual cusp of the first premolar is more conical in shape than the buccal one. The root is flat, non-grooved, and usually has two canals. However, all stages of root division can be identified. The crown of the second premolar is usually somewhat smaller and more symmetrical and both its cusps are almost equally high. The root is not so often divided. In the first maxillary premolar from Krapina, which is very well preserved due to non-abraded occlusal surface, the molar tubercle and the cingulum are missing. The labial side of the root bears two vertical grooves, similar to modern humans. The occlusal pattern is, however, strongly molarised. The premolars from Le Moustier und Monsempron are barely distinguishable from those of modern humans. Their crown is mesio-distally somewhat stronger compressed than that from Krapina where a cubical shape can be observed. It is interesting that the older find from Steinheim exhibits mesio-distally narrower premolars than the more recent Le Moustier find. In Le Moustier and Monsempron there is no cingulum on the labial side but the basal part is prominent and is reminiscent of the molar tubercle. The roots of the first premolars from La Quina are doubled. The root of the first premolar from Spy II is doubled and that of the second premolar is bifurcated along two thirds of its length. Both of the maxillary premolars from Monsempron, according to an X-ray image, have single roots. From among the 17 premolars from Krapina, two have doubled roots, which means that the incidence of root furcation is relatively rare here. In present-day Europeans, 55–70% of the maxillary and 14–18% of the mandibular premolars have two roots. The low frequency of two-rooted premolars in the Neanderthals is probably connected with a tendency to taurodontism. In the second maxillary premolar from La Quina, the root is mesio-distally flattened and has two tips. Otherwise it is simply formed.

The position of the premolars from Kůlna in relation to modern humans is evident from a comparison with the data by Mühlreiter. For the first premolar of modern humans, this author gives a total length of 16.2 to 28.2 mm. The first premolar from Kůlna Cave with its total length of 24.9 mm thus falls within this range of variation. The height of dental crown in modern humans varies between 7.0 and 10.8 mm. The crown height in the first premolar from Kůlna Cave is 8.1 mm, which means that it lies below the mean value of the range of variation in recent population. The crown width in modern humans is reported to be 6.5–8.0 mm and the bucco-lingual thickness of the crown 7.5–10.0 mm. The crown width in the first premolar from Kůlna Cave is 7.4 mm, where it approaches the mean value in modern humans, and the bucco-lingual thickness of 9.8 mm approaches the upper limit of the range of variation in modern humans.

The total length of the second premolar in modern humans varies between 15.7 and 27.2 mm, in the Kůlna find it is 23.0 mm (*Table 3, Figure 11*). The crown height in modern humans is 6.0–10.2 mm, in the second premolar from Kůlna Cave 7.4 mm, approaching the mean value in modern humans. The crown width of the second premolar is 6.0–7.5 mm, and the bucco-lingual thickness 9.0–11.0 mm. The corresponding values in our find are 7.0 mm or 10.0 mm respectively, they lie between the mean value and the upper limit of the range of variation in modern humans.

TABLE 3. Dimensions of the second premolars in *Homo sapiens neanderthalensis* and *Homo sapiens sapiens*.

			Mesiodistal diameter	Buccolingual diameter	Height	Index	Length
1	Kůlna		7.0	10.0	7.4	70.0	23.0
2	Le Moustier (Klaatsch 1909)	Right	8.0	11.0		72.7	
3	Le Moustier (Klaatsch 1909)	Left	8.0	11.0		72.7	
4	Krapina (Gorjanović-Kramberger 1906)	Min	8.1	10.2		79.4	
5	Krapina (Gorjanović-Kramberger 1906)	Mean	8.2	10.4		79.1	
6	Krapina (Gorjanović-Kramberger 1906)	Max	8.3	11.3		73.4	
7	Krapina (Gorjanović-Kramberger 1906)	$P^1 + P^2$	8.0–8.25	11.35–11.4	8.0–10.1	71.0	
8	La Quina	Right	8.0	10.6	8.0 int. 5.0 ext.	75.4	
9	La Quina	Left	7.3	10.5	6.0 int. 7.5 ext.	69.5	
10	Spy I		6.0–6.5	9.5–10.0	6.0–6.6 ext.		
11	Spy II		7.0–7.5	10.5–11.0	7.0–7.5 ext.		
12	Neanderthals	Mean	7.5	10.8		69.9	
13	Recent human (Black)	Min	6.0	7.5	7.0	80.0	
14	Recent human (Black)	Mean	6.8	8.8	7.5	77.2	
15	Recent human (Black)	Max	8.0	10.0	9.0	80.0	
16	Tabun I		6.5	9.6	6.2	67.7	
17	Skhul II		7.2	8.6	4.5	83.7	(18.5)
18	Skhul IV		7.6	8.3	4.0	91.6	18.0
19	Skhul V		7.7	9.1	4.7	84.6	(19.5)
20	Recent human (Mühlreiter)		6.0–7.5	8.0–11.0	6.2–10.2		15.7–27.2
21	Monsempron		8.0	10.5	7.0	76.1	
22	La Ferrassie I		5.6	9.0		61.1	
23	La Ferrassie II		6.5	12.0		54.1	
24	Kafzeh 6		6.5	9.5		68.4	
25	Kafzeh 7		7.0	10.5		66.6	

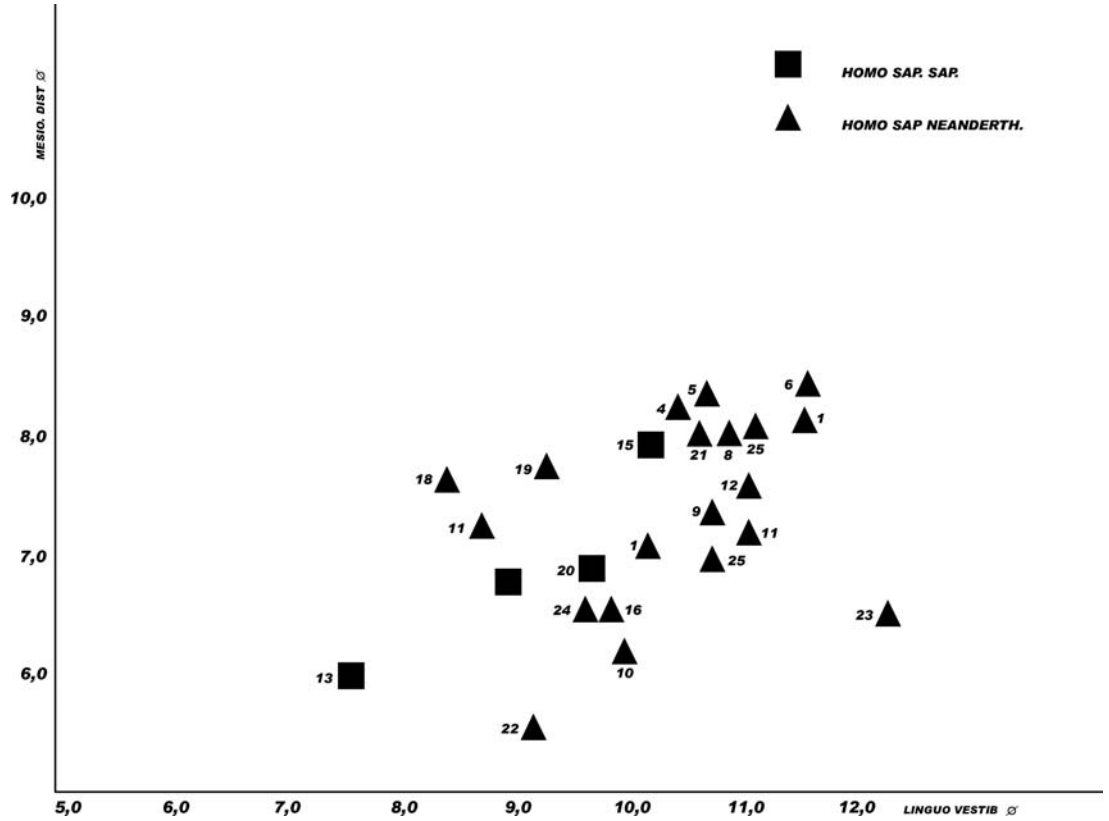

FIGURE 11. A correlation between the mesio-distal and linguo-vestibular diameter of the second premolars (see, *Table 3*). This figure was in Jelínek (1967) labelled as Graf 3.

FIRST MOLAR

The most interesting of the teeth obtained from Kůlna Cave is the first maxillary molar (*Figures 5, 6, 9, 12, 13*). Similar to the majority of fossil and recent first molars it also has a rhombic dental crown. The largest eminence is the paracone. On the mesial part of the crown a small anterior fovea can be seen. At the corner of the protocone there is a very small fovea Carabelli, which is placed somewhat mesially. On the lingual side of the crown of this tooth a vertical groove can be seen, which extends to the palatinal root. Gorjanović-Kramberger (1906) observed this groove at various stages of intensity in 18 out of 36 Krapina teeth. In the first molars from Krapina, Gorjanović-Kramberger describes a similar groove in 10–11 cases. A similar groove was also observed with two second molars from Krapina. The deep groove virtually marks the line of coalescence of corresponding cusps or roots respectively. The protocone and metacone in the molar from Kůlna are interconnected by a strong ridge, which is indented by small transversal grooves. The metacone, which was described by Blanc in the second molar from Leuca I as an important primitive trait, is not developed here. Only an indication thereof is visible on the *linea obliqua*. This condition advises caution because this trait in Neanderthal molars is found at various stages of development and it passes fluently into the typical *crista obliqua*. The hypocone is massive and free-standing; it is almost as large as the paracone. In the exposed part of the root, on the buccal and lingual root, a longitudinal groove can be observed which is weaker on the buccal root. Further distally it can be seen that the lingual and the buccal root begin to separate immediately below the dental neck and are no longer connected.

It is worth mentioning among the primitive traits, we see, above all, the small anterior fovea and the *crista obliqua* and furthermore, also the vertical longitudinal groove on the lingual side of the crown and at the root. In the same way as the other teeth from Kůlna Cave, the first molar with its dimensions not only does not go beyond the range of variation in modern humans but even approaches their average values. On the distal side

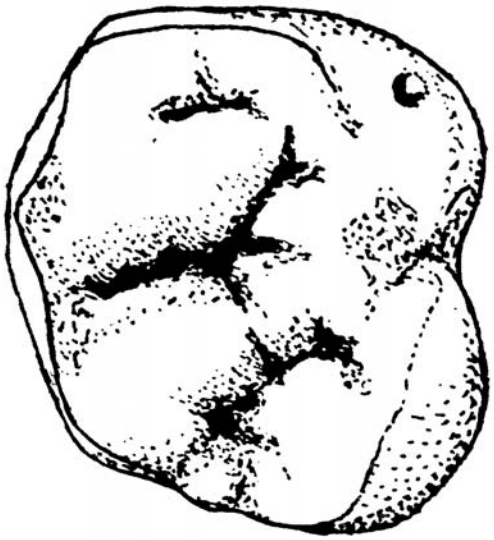

FIGURE 12. Occlusal surface of the first molar. This figure was in Jelínek (1967) labelled as Fig. 9.

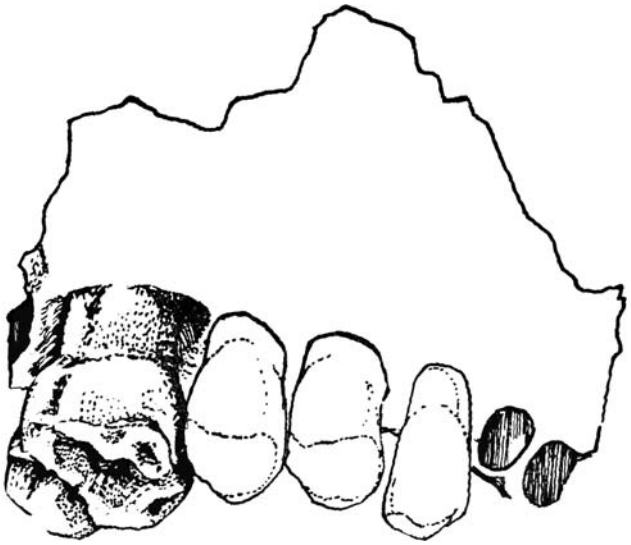

FIGURE 13. Exposure of dental neck in the first molar. This figure was in Jelínek (1967) labelled as Fig. 10.

of the crown a contact facet for the second molar is visible, which proves that the latter tooth had already erupted in its place. Based on the fact that the occlusal surface of the first molar shows weak but distinctive abrasion marks which cannot be identified with the occlusal surface of the second premolar and, in addition, that the second premolar evidently did not reach the height of the other teeth, we can conclude that the second molar in our find had erupted earlier than the second premolar.

It is interesting that the occlusal morphology of the first molar from Kůlna Cave can relatively well be compared to that of the maxillary second molars from Le Moustier and Tabun. We can observe similar forms of the crest (*crista obliqua*), hypocone, protocone and the incidence of a fovea Carabelli. In the Kůlna find only the anterior fovea is smaller and from the paracone runs out a single ridge distally of the anterior fovea, whereas in Tabun and Le Moustier two parallel ridges can be observed. The tooth from Kůlna Cave does not exhibit any traces of anomoplasia (proliferation of grooves), which can be observed with several molars from Krapina. In both of the first molars from Le Moustier, Klaatsch (1909) described a cusp of Carabelli. In almost all the first and sometimes also other molars from Krapina, Gorjanović-Kramberger (1906) reports a cusp or fovea of Carabelli; the cusps of Carabelli, however, are formed not as markedly as is sometimes observed with modern humans. The aforesaid foveas and cusps also represent one of the morphological traits connecting the Neanderthals with modern humans. It seems that this trait was relatively constant in the Neanderthals because until today it was identified in most of the Neanderthal molars found. It is, however, also frequent with present-day Europeans and Jeanselme (1917) identifies it in 50% of modern European population. According to McCown and Keith (1939) it also is to be considered consistent for example in the Bushmen. It can be concluded that the first Neanderthal molar, from a metrical point of view, is mostly larger than the first molar of modern humans. The Mount Carmel and Saccopastore finds are the only exceptions

The first maxillary molars from Skhul I and Skhul X have four cusps. In Skhul II, this tooth has a small hypocone, which is almost completely absent in the second molar. All of the teeth exhibit short roots.

In the first molar from Engis (Fraipont 1936), the crest connecting the paracone and the metacone is indented by transversal grooves, as is also the case with Pech de l'Azé.

As far as the dimensions of the teeth are concerned, the first maxillary molars of the Neanderthals with their mesio-distal diameter vary between 9.5 mm (Spy I) and 13.4 mm (Krapina C) (*Table 4, Figure 14*). The mean value lies at 11.6 mm. The maximum values exceed those in modern humans; the mean value approaches the maximum values of the Europeans by Black and exceeds the Europeans of de Terra (1905) by approximately

a tenth, but approaches the mean value in present-day population of the Loyalty Islands. The linguo-vestibular diameter varies between 11mm (Spy I) and 13.5 mm (Krapina), with a mean value of 12.3 mm. The maximum is exceeded by the highest values in modern populations, 14 mm in the population of the Loyalty Islands and 14.2 mm in an individual from the Timor Island (de Terra 1905), but the latter case is most probably exceptional. The mean value is identical with corresponding values in some recent populations (Loyalty Islands, New Caledonia). The teeth are thus relatively very strong, corresponding to several present primitive populations. It is above all the Melanesians who have only slightly smaller molars than the Neanderthal populations.

The first maxillary molar from Pech de l'Azé has the same dimensions as the compared recent molars and shows the same rhombic outline with four cusps. The crest between the protocone and the metacone is present and so is also the small cusp of Carabelli. On the other hand, neither the anterior nor the posterior fovea is developed. The hypocone is smaller than with Le Moustier.

The length-width index in the Neanderthals varies between 96 and 116 (both values come from the Krapina finds). 106 can be accepted as the mean value; this value also corresponds to Krapina D. The average in general is thus only a little different from recent humans, and the mutual relation between both of these tooth diameters expressed by the index does not provide any reliable phylogenetic support.

The molars from Monsempron, Krapina, Le Moustier and Steinheim are well preserved. All of them are closer to recent humans than to Sinanthropus, as is evident from the studies by Weidenreich (1937) among others. A typical feature of Neanderthal molars is the reduction of cusps and simplification of relief compared to earlier developmental stages. They mostly show a well-developed *crista obliqua* and anterior fovea. On the protocone (the anterior inner cusp) of the molars from Krapina and Le Moustier there is a small groove, which Gorjanović-Kramberger (1906) considers to be a residue of Carabelli's cusp. The dental roots in Le Moustier, La Quina III, Krapina, Steinheim, Monsempron and Saint Brelade are sometimes almost prismatic in shape.

The outline of the molars is usually more or less rhombic. De Jonge-Cohen (1928: 92) describes in recent humans a groove between the protocone and the

TABLE 4. Dimensions of the first molars in *Homo sapiens neanderthalensis* and *Homo sapiens sapiens*.

		Mesiodistal diameter	Buccolingual diameter	Height	Index	Length
1	Tabun	10.8	11.5	5.8	93.9	(17.0)
2	Skhul I	11.6	10.5	7.0	110.4	
3	Skhul X	(13.0)	11.2	9.0	116.0	(16.5)
4	Skhul VII	10.6		2.6		16.0
5	Skhul IV	11.5	11.2	3.5	102.6	(17.0)
6	Skhul V	11.3	11.5	4.0	98.3	(18.0)
7	Kůlna	11.2	12.3	6.7	91.0	(18.0)
8	Spy I	12.0–12.5	12.0–12.5	6.5		
9	Europeans, *N* = 15 (Topinard)	10.6	10.6		105.0	
10	Africans, *N* = 15 (Topinard)	11.3	10.6		107.6	
11	New Caledonians, *N* = 15 (Topinard)	11.9	10.4		114.4	
12	Recent human (Mühlreiter)	7.8–11.2	10.4–13.0	6.8–9.0		17.5–29.0
13	La Ferrassie I	8.0	12.0		66.6	
14	Monsempron	11.0	12.0	5.0	91.6	20.5
15	Krapina (2 teeth)	12.1	13.0		93.0	22.6
16	Recent human	10.7 (8.0–11.5)	11.8 (9.8–13.2)	7.6	90.6	20.7
17	La Ferrassie II	10.5	13.0		80.7	
18	Kafzeh 7	12.0	12.0		100.0	
19	Kafzeh 6	11.5–12.0	12.5–13.0			

paracone, which is terminated mesially by two small foveas. According to de Terra (1905), the transversal foveas of the maxillary molars lie distally more often than mesially, that is opposed, as with the mandibular molars. They are also rarer to find in the maxillary molars. According to Gregory, the first maxillary molar from Le Moustier differs from anthropoid molars by a larger hypocone, which is situated more lingually. The outline of the tooth, its ridulation, the size of the hypocone, the presence of the Carabelli's cusp, of the anterior and posterior fovea, taurodontism and exposure of the dental neck are among the distinctive features of this tooth. In a child's molar from La Quina, the paracone overtops distinctly all the other teeth, and three normal non-taurodontic roots can be observed here. In the adult individual from La Quina, H. Martin (1923) described the right maxillary molar, whose paracone is the largest eminence. The occlusal grooving of this tooth was evidently quite primitive and complicated. The first molar from Spy I has four cusps and three roots and a massive rhombic shape, similar to the first molar from Spy II. The first molar of the child from Pech de l'Azé is rhombic in shape, has four main cusps and an accessory cusp of Carabelli. The anterior and posterior fovea, however, are missing. The hypocone is developed less than that of an analogous tooth from Le Moustier.

The first maxillary molar from Petit Puymoyen (Siffre 1908) has four cusps; the paracone is particularly large, and the hypocone is isolated and free-standing. The outline of these teeth is rhombic again. Fraipont (1936: Tab. III, Fig. 18) describes a rhombic first molar in the child from Engis. This tooth differs from Pech de l'Azé mainly by a convex lingual margin (without a saddle-shaped depression between the paracone and the metacone), which is indented by grooves, even though not as strongly as was observed with some molars from Krapina. The crest connecting the protocone and the metacone is transversally grooved, similar to the molar from Pech de l'Azé.

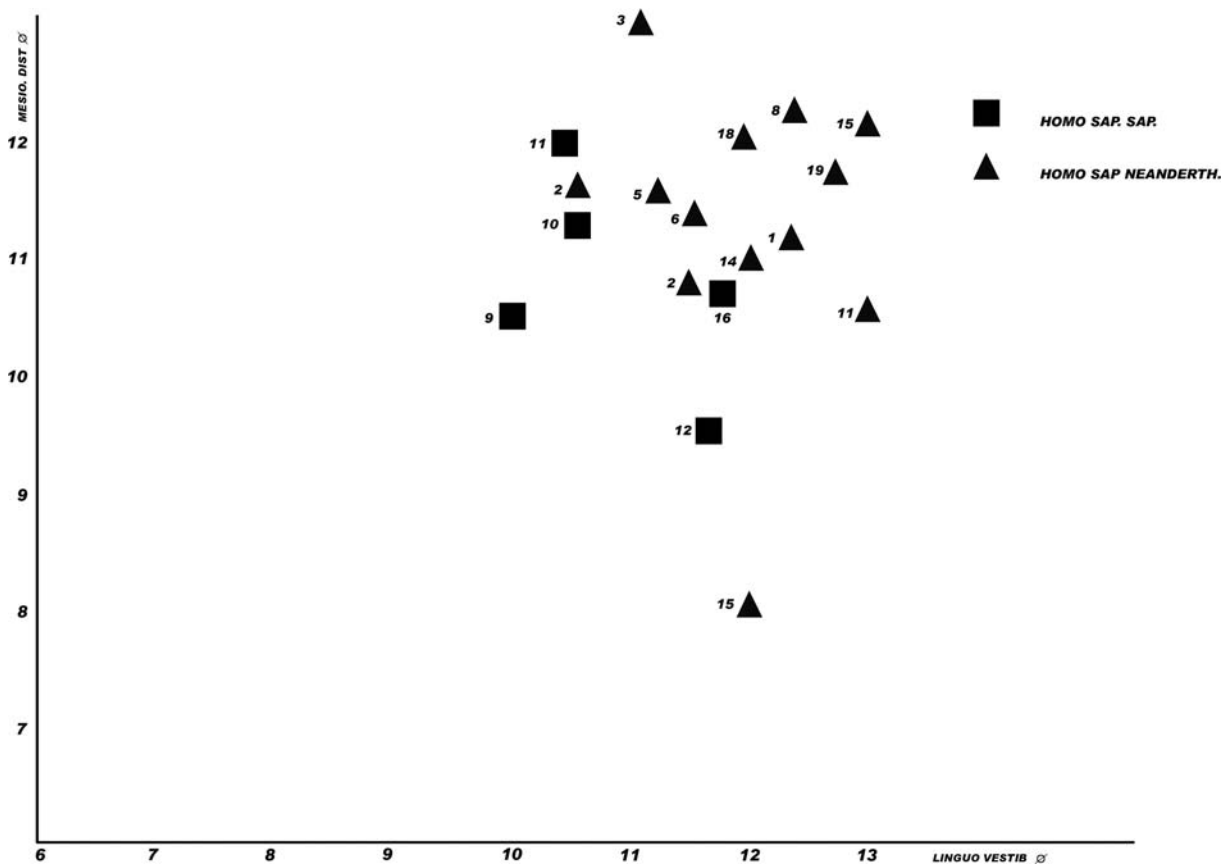

FIGURE 14. A correlation between the mesio-distal and linguo-vestibular diameter of the first molars (see, *Table 4*). This figure was in Jelínek (1967) labelled as Graf 4.

From Krapina, Gorjanović-Kramberger (1906) described a total of 15 first molars, among them nine loose, three in situ and three still non-erupted. All of the maxillary molars had four cusps. In the second molar very often a reduction or even absence of the distal inner cusp (hypocone) was observed.

The occlusal surface of the first maxillary molar is mostly obliquely rhombic in shape, with two buccal and two lingual cusps separated from each other by two longitudinal and one transversal grooves. The mesial lingual cusp is mostly the largest one in modern humans, whereas the distal lingual cusp is usually smallest. Both of the buccal cusps are normally of equal size. The tubercle of Carabelli lies on the lingual side of the anterior lingual cusp. This occlusal pattern is sometimes replaced by an H-shaped system of grooves with a connecting crest between the anterior and posterior buccal cusps. The palatinal (lingual) side bears a groove passing into the occlusal surface. The buccal side is mostly larger than the lingual side and passes over a sharp crest into the central surface and over a blunted crest into the distal surface. The distal surface is usually smaller than the mesial one and is also narrower and more arched. In most cases three roots are present, two buccal and one palatinal. The buccal roots are flattened, bearing a transversal groove, which is also visible on the adjacent surfaces. The palatinal root is often rounded and almost always has a groove. The anterior buccal root is shorter and wider than the posterior one; both these roots diverge. The palatinal root in the second molar is usually narrower.

In both of the first molars from Le Moustier, Clark described a cusp of Carabelli, and the hypocone is here partly bifurcated by a longitudinal groove. The left molar bears five cusps. The first molar is generally being considered the most primitive and most conservative among all molars. The incidence of four depressions is interesting, one central, one mesial and another two, which separate the paracone, metacone, protocone and hypocone from each other. According to de Terra (1905), transversal depressions can more often be seen on the distal part of the maxillary molar. They are also more seldom than with the mandibular molars where they are, on the other hand, more frequently found on the mesial part of the crown. However, a whole range of developmental forms and intensity stages can be identified not only with fossil finds but also with recent anthropoids and modern humans as well. If a higher frequency of this formation would be identified in Neanderthal molars, then a question would arise whether it can be brought into relation with a tendency to form complicated occlusal patterns. In Le Moustier, the hypocone is large and lies more lingually.

In Krapina B, the crown has the form of a considerably elongated rhomboid, not entirely regular due to a markedly developed hypocone. The occlusal surface bears numerous grooves The case with the maxillary molars from Krapina C is also similar. Krapina D exhibits an elongated rhombic shape with a large hypocone and a small fovea Carabelli. The isolated molar from Krapina (Gorjanović-Kramberger 1906, 193, Tab. XIV) with an irregularly elongated rhombic crown (because the hypocone is of the same size as the other cusps) bears a small fovea Carabelli and more complicated grooves on the occlusal surface than those in all the other maxillary first molars from Krapina. The crests of the protocone and paracone often exhibit a tendency to merge together and delimit the anterior fovea. It is interesting that all of the 13 first molars from Krapina have a fovea Carabelli. The growing together or coalescence of roots in the Neanderthals has various forms. In the first molar from Tabun taurodontism was not identified, its roots are separated. Taurodontism has already been the topic of many studies. According to Gorjanović-Kramberger (1906), five out of 12 first molars have triple roots and in seven specimens the roots had more or less grown together. In the child from La Quina the occlusal pattern of the first maxillary molar is formed by four cusps. The paracone overtops the remaining cusps. The isolated roots are well-developed, non-taurodontic, the mesial root is strongest. They are connected by enamel layers. In the right maxillary molar of the adult individual from La Quina, the paracone also is the strongest cusp. Here also the outline of the crown has the form of an elongated rhomboid. The occlusal surface has a relatively complicated topography. The roots bifurcate just below the neck so that taurodontism is not observed here either. The first maxillary molars from Spy I and Spy II are rhombic.

The first molar exhibits a considerable variability in both the Neanderthals and recent Europeans. It does not bear any significant traits that would reliably distinguish the Neanderthals from modern humans. Neither taurodontism nor a distinctive occlusal relief or dimensions can be applied as distinguishing features.

Keith and Cown in their publication (1939) distinguish the Skhul population as "neanthropic" from the rather palaeoanthropic Tabun finds. In my work (Jelínek 1965) comparing the mandibulae of the palaeoanthropic type, I expressed doubts about the reliability of such classifications. The study of dentition confirms this opinion. Particularly in two finds (Skhul I and Skhul VII) the authors McCown and Keith (1939) themselves declared a "distinctly Neanderthaloid"

nature. Even though, despite this conclusion, they try to class Skhul I with the remaining finds and distinguish it from the Tabun finds. They relate that among the incisors, which are considered by them the main distinguishing feature of both types, the first maxillary incisor from Skhul I bears a distinct lingual tubercle but its form and the degree of differentiation of the dental crown is reminiscent rather of the other teeth from Skhul and not of those from Tabun. "On the other hand, the maxillary central incisor of primary dentition shows the very same form as the corresponding tooth from Tabun Cave." The Skhul I and Skhul VII individuals differ from the other finds from this locality by a higher frequency of palaeoanthropic traits, and the Tabun II find differs from Tabun I by a lower frequency of the same characteristics. This situation and the overall nature of dentitions from Tabun and Skhul lead me to conclude that the finds from both these localities should not unequivocally be considered two different types. In both of them in fact both neanthropic and palaeoanthropic traits can be identified; moreover, the finds from Tabun are not sufficient in number and both of the presently available individuals, Tabun I and Tabun II, exhibit a considerable variability. According to McCown and Keith (1939), both of the maxillary incisors in Skhul VII (a female), as far as their shape and size are concerned, are formed almost the same as those from Tabun I. The authors admit that the Skhul VII teeth exhibit the same relief as the teeth from Tabun and that the main difference between the dentitions from Tabun and Skhul lies in the incisors.

The crowns of the first maxillary molars from Skhul VII show rhombic outline with a large paracone and hypocone, similar to Tabun I. The first and also the second maxillary molar exhibit a distinct taurodontism of the roots which is even stronger than with Tabun I. It is interesting to compare the size of the canines. The largest Neanderthal canine comes from Krapina, and in this comparison Tabun is much smaller than Skhul. Regarding the size, too, Tabun is more remote from Krapina than from Skhul. In Skhul VII, the *linea obliqua* and the groove are formed similar to Tabun. The incorrect evaluation of the Tabun finds and their insufficient number led McCown and Keith (1939) to bring the Tabun finds into relation with Krapina or also with the Western European Neanderthals, as opposed to Skhul, which they compare to the Australians and to other finds of neanthropic type. Thus, it can be concluded that classifying the Skhul finds as the neanthropic type, in contrast to Tabun, which is classed with the palaeoanthropic type, distorts the overall picture. In both these cases we are involved with transitional types in which various traits occur with varying frequency, and these both in populations as a whole and in individuals.

CONCLUSION

Our observations can be summed up in brief as follows:

The find of the right part of a maxilla from the Mousterian layer of Kůlna Cave in the Moravian Karst belongs to a 14-year-old individual. The find exhibits a whole series of both primitive and progressive traits.

Among primitive traits, there is the presence of prenasal fossa, absence of anterior nasal spine, the notable height of the maxilla, a *linea obliqua* on the first molar, a small anterior fovea and a vertical groove on the dental crown that passes on down to the root. Progressive traits comprise a weak indication of the canine fossa, a deep small-sized palate, generally small-sized teeth, the neanthropic form of the anterior dental arch, the neanthropic morphology of both premolars, and only a very indistinct taurodontism of dental roots.

This mixture of progressive and primitive traits is typical not only of this new find from Kůlna Cave but also of many earlier finds, particularly of those from Central and Eastern Europe and from the Near East. The author considers the find from Kůlna Cave further evidence of a developmental type of the Neanderthal humans that clearly indicates a continuous transition from older forms to later *Homo sapiens sapiens*. In accordance with his former publications he thus designates this find of a Neanderthal human from Kůlna Cave, too, as *Homo sapiens neanderthalensis*. In terms of stratigraphy, palaeontology, and archaeology, this find was unequivocally dated to the final phase of the first Würm stadial (Würmian I). After a detailed description and analysis of the morphology of the maxillae and individual teeth of various Neanderthal finds and after comparing their traits with modern humans, the author emphasises variability and continuous morphological transitions and herewith also the fact that neither of the traits under review can by itself be applied as a reliable criterion of distinguishing between the Neanderthals and modern humans.

Similar to many other traits, the comparison between dentitions and maxillae also shows that the differences between the Neanderthals and modern humans do not represent the rank of a species but only a subspecies, that the later types of *Homo sapiens sapiens*, at least those in Central, Eastern, and South-eastern Europe, emerged

from the older types of *Homo sapiens neanderthalensis*, and that the transitional types, such as the finds from Skhul, Kafzeh, etc., do not give any proof of admixture but should rather be regarded as a result of biological development of populations. The same also applies to the wide variability as is exemplified by the finds from Krapina, Ehringsdorf, Tabun among others. The described new find of a Neanderthal jawbone provides further support to these studies and opinions.

REFERENCES

COULONGES L., LANSAC A., PIVETEAU J., VALLOIS H., 1952: Le gisement préhistorique de Monsempron (H^te^-Garonne). *Annales de Paléontologie* 38: 81–120.

DE JONGE-COHEN T. E., 1928: *Mühlreiters Anatomie des menschlichen Gebisses, 5. Ed*. Felix, Leipzig.

DE TERRA M., 1905: *Beiträge zu einer Odontographie der Menschenrassen*. Universität, Zürich.

FRAIPONT C., 1963: *Les Hommes fossiles d'Engis*. Arch. de l'Institut de Paléontologie humaine, mém. No 16, Paris.

GORJANOVIĆ-KRAMBERGER D., 1901: Der Palaolische Mensch und sein Zeitgnossen aus dem Diluvium von Krapinain Kroatien I. *Mitteilungen der anthropologischen Gesellschaft in Wien* 3l: 164–197.

GORJANOVIĆ-KRAMBERGER D., 1906: Der diluviale Mensch von Krapina in Kroatien. Ein Beitrag zur Paläoanthropologie. In: O. Walkhoff (Ed.): *Studien über die Entwicklungs-Mechanik des Primatenskeletes, Volume 2*. Pp. 59–277. C. W. Kreidel, Wiesbaden.

HAMY E. T. J., 1869: De l'épine nasale antérieure dans l'ordre des Primates. *Bulletins de la Société d'Anthropologie de Paris* 4: 13–28.

HRDLIČKA A., 1930: *The skeletal remains of early man.* Smithsonian miscellaneous collections 83. Smithsonian Institution, Washington.

JEANSELME M. E., 1917: Du tubercle de Carabelli etc. *Bulletins de la Société d'Anthropologie de Paris* 6: 8.

JELÍNEK J, 1965: Die Kiefer aus der Šipka-Höhle (srovnávací studium šipecké čelisti). *Anthropos* 17: 135–179.

JELÍNEK J., 1966: Jaw of an intermediate type of Neanderthal man from Czechoslovakia. *Nature* 5063: 701–702.

KLAATSCH H., 1909: Preuves que l'Homo Mousteriensis Hauseri. *L'Homme Préhistorique* 7: 10–16.

MARTIN H., 1923: *L'homme fossile de la Quina*. Octave Doin, Paris.

MCCOWN, T. D., KEITH, A., 1939: The Stone Age of Mt. Carmel II. The fossil human remains from the Levalloiso-Mousterian. Clarendon Press, Oxford.

SIFFRE A., 1908: Étude des dents humaines. *Revue mensuelle de l'École d'Anthropologie de Paris* 18: 66–72.

VALOCH K., 1967: Die Steinindustrie von der Fundstelle des menschlichen Skelettrestes I aus der Höhle Kůlna bei Sloup (Mähren). *Anthropologie (Brno)* 5, 1: 21–31.

WEIDENREICH F., 1937: The dentition of "Sinanthropus pekinensis". A comparative odontography of the hominids. *Paleontologia sinica, New Series D* 1: 1–180.

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