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A NOTE ON THE TEETH OF MEGANTHROPUS
AFRICANUS WEINERT FROM TANGANYIKA
TERRITORY

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A fossil member of Hominidae from the Serengeti district of the Tanganyika territory, discovered by Kohl-Larsen in 1939, had been in 1948 referred to as *Praeanthropus* by Hennig,¹ but was subsequently labelled *Meganthropus africanus* by Weinert of Kiel University². Weinert, in this study, in which he contrasted the remains from East Africa only briefly with the corresponding parts of recent man and the lower jaw of *Meganthropus*,³ attributed the African form to the same genus with *Meganthropus palaeojavanicus* von Koenigswald, first described by the late Weidenreich,⁴ from the Djetis beds of Java.⁵ The teeth of this form from the Laetolil beds⁶ of

¹ Hennig, 1948, p. 214.

² Weinert, 1950, p. 139.

³ *Ibid.*, Pls. XII - XIV and Pl. XV, fig. 1.

⁴ Weidenreich, 1945, p. 34.

⁵ von Koenigswald, 1949, p. 97; von Koenigswald, 1950, pp. 59-60; Movius, 1949, pp. 21-22. von Koenigswald (1949, p. 97) attributes The Djetis fauna to the Lower Pleistocene, while Hooijer places *Kali Glagah* and *Tjidjoelang* faunas, in descending order, below the Djetis fauna as representing still earlier phases of Pleistocene in Java, since these faunas include *Archidiskodon* (see Hooijer, 1951, pp. 272 and 274; 1952, p. 441).

⁶ Oakley, 1954, p. 15.

Tanganyika territory, were afterwards described and compared in detail by Remane,⁷ who also kept the name coined by Weinert, viz., *Meganthropus africanus* Weinert.

Subsequently, in 1953, Robinson, the able successor of the late R. Broom at the Transvaal Museum in South Africa compared P³ and P⁴ of *Meganthropus africanus* Weinert with the corresponding teeth of Australopithecinae.⁸ In this study Robinson stated in conclusion: "*In my opinion 'Meganthropus' africanus is an australopithecine, which is almost certainly more closely related to the South African forms than to M. palaeojavanicus. There seems to be no justification for referring it to the genus Meganthropus. If it is to be referred to an already existing genus then Plesianthropus is the obvious choice. However the available material is too scanty to allow of certainty in referring it to any known genus. There seem to be no important features about the specimen differentiating it from Plesianthropus but this does not mean that additional material would not bring such differences to light. It is quite probable that additional specimens would show that the species should be placed in a new genus, but coining a new generic name at this stage seems to me unwise and, in fact, unjustifiable as the known specimen cannot be satisfactorily distinguished from plesianthropus. It seems wiser to leave the baptism of this type until more specimens are available. The chief importance of the specimen lies in the fact that it proves that the australopithecines were not confined to southern Africa. This is additional support for the proposition that the australopithecines were at one time a widely distributed group.*"⁹ In a note published in 1954, Remane

⁷ Remane, 1951, p. 311.

⁸ Robinson, 1953, pp. 1-9.

⁹ Ibid., p. 9. von Koenigswald (1954, p. 85) also agrees with this conclusion of Robinson. In his recent study von Koenigswald (1954, p. 85) states: "*We agree with ROBINSON that Meganthropus africanus, collected by KOHL-LARSEN in East Africa has nothing to do with our javanese form and rather belongs to the Australopithecinae. Of this species only the fragment of an upper jaw containing the two premolars is known (a molar of normal size referred to the same species had better be excluded); because of the large size WEINERT attached the name Meganthropus to this find, but of the type species no upper premolars are known. The view that the specimen in question might belong to an Australopithecinae, has already been expressed earlier: first by W. ABEL (vide: L. KOHL-LARSEN, 1943), later by TEILHARD DE CHARDIN (1952, p. 347) and the present author (von KOENIGSWALD, 1953, p. 132). In this case a decision might be possible, as all Australopithecinae have only two roots on the first upper premolar, while in Pithecanthropus modjokertensis the same tooth still has its original three roots and we might expect the same condi-*

replied, although he does not specifically state so, to Robinson.¹⁰ In this newer study Remane insists on his earlier conclusion and states: "Meganthropus africanus is a very primitive hominid, who in structure of the premolars is nearer to the pongids than is any other hominid known till now. The determination of the relationship to the other Hominidae of the Pleistocene is difficult. The resemblances with the South African hominids Plesianthropus, Australopithecus and Paranthropus are not very distinct."¹¹ Further on he adds: "Robinson's newly published paper ('53) gives a detailed description of the P³ of Plesianthropus and comes to the conclusion that this tooth is very near to that of Meganthropus africanus (fig. 3). But there is no antero-exterior extension of the buccal surface in Plesianthropus; the main cusp is lower. I doubt whether the more pongid premolars of Meganthropus africanus are the same species as Plesianthropus."¹²

In a more recent study on the classification of the known forms of Australopithecinae, Robinson has eliminated the genus *Plesianthropus* Broom and has placed it in genus *Australopithecus* Dart, which he considers includes only one species, viz., *Australopithecus africanus* Dart.¹³ In this new study Robinson includes *Meganthropus africanus* Weinert in *Australopithecus africanus* Dart, placing it together with *Australopithecus prometheus* Dart and *Plesianthropus transvaalensis* Broom in the subspecies *Australopithecus africanus transvaalensis*, while putting the original find from Taungs, described by Dart in 1925,¹⁴ in the

tion in Meganthropus s. str." Unfortunately W. Abel's (1943) and Teilhard de Chardin's (1952) studies are unavailable to me. However, regarding W. Abel's (1941) ideas, von Koenigswald (1953a, p. 132) states: "W. ABEL [25] hat in diesem Funde seinerzeit einen Australopithecus vermutet, und in der Tat lässt die Grösse der Kronen, die Kürze der Wurzeln und die beim zweiten Prämolaren noch deutlich zu erkennende angedeutete Dreiwurzlichkeit sehr an solche Formen denken."

¹⁰ Remane, 1954, p. 123.

¹¹ *Ibid.*, pp. 124-125.

¹² *Ibid.*, pp. 125-126.

¹³ Robinson, 1954b, pp. 196 and 199. Regarding *Australopithecus*, Robinson (1954b, p. 199) states: "Australopithecus contains a single species with two subspecies, containing the specimens from Taungs, Sterkfontein, Makapan and East Africa." In this connection it is also of interest to recall that the late Broom had originally named the Sterkfontein form *Australopithecus transvaalensis* and then changed its name to *Plesianthropus transvaalensis* in 1938 (see Broom, 1938, p. 377).

¹⁴ Dart, 1925.

subspecies *Australopithecus africanus africanus*.¹⁵ Regarding *Meganthropus africanus* Weinert, however, Robinson makes the following reserved statement: "The so-called *Meganthropus africanus* of Weinert, known only from a fragment of maxilla containing P³ and P⁴, cannot be distinguished from the Sterkfontein apeman (see Robinson, '53) and therefore falls into the same subspecies as the latter on present evidence. As it comes from central Africa it may well be representative of another subspecies or even species. Until further material is available it cannot legitimately be given separate status."¹⁶

As my interest in the fossil members of Hominidae from Africa goes back to 1940 and 1941¹⁷ I have felt a keen interest in the remains found by Kohl-Larsen, the discoverer of the remains of *Africanthropus njarasensis* Weinert,¹⁸ in the region of Lake Eyasi (Njarassa-See) in 1939. I have compared the drawings and measurements published by Remane,¹⁹ with the teeth of anthropoids, Australopithecinae and fossil hominids. This study has led me to the conclusion that the teeth attributed to *Meganthropus africanus* Weinert, as already has been concluded by Robinson²⁰ and von Koenigswald,²¹ do not at all belong to *Meganthropus* represented by *Meganthropus palaeojavanicus* von Koenigswald from the Djetis beds of Java,²² but comes nearer to Australopithecinae of South Africa, representing, however, in contrast to the conclusion of Robinson,²³ a genus distinct from *Australopithecus* and *Paranthropus*.

¹⁵ Robinson, 1954b, p. 196. In this new study Robinson (1954b, p. 196) also includes *Paranthropus crassidens* in the species *Paranthropus robustus* Broom, regarding it as a separate subspecies of this species and considers *Meganthropus palaeojavanicus* von Koenigswald as the second species of genus *Paranthropus* Broom. The two subspecies of *Paranthropus robustus* Broom are named by Robinson (1954 b, p. 196) *Paranthropus robustus robustus* and *Paranthropus robustus crassidens*.

¹⁶ Robinson, 1954b, p. 195.

¹⁷ See Şenyürek, 1940 and 1941.

¹⁸ See Weinert, 1939, p. 253.

¹⁹ Remane, 1951, figs. 1-3 and Remane, 1954, figs. 1-3.

²⁰ Robinson, 1953, pp. 8-9.

²¹ von Koenigswald, 1954, p. 85.

²² On this occasion I wish to express my gratitude to my good friend Dr. von Koenigswald of Utrecht University, The Netherlands, for allowing me to study the remains of *Meganthropus* and *Pithecanthropus* from Java and *Gigantopithecus* from China, while he was working in the American Museum of Natural History of New York in 1947.

²³ Robinson, 1954b, p. 196.

The results of this comparative study are given below. As the photographs and drawings of the teeth attributed to *Meganthropus africanus* Weinert have been published by Weinert²⁴ and Remane²⁵ no pictures of this form are reproduced here. Furthermore, in this paper, although I consider the classification of South African Australopithecinae given by Robinson to be basically sound, in order to prevent confusion, instead of the new names utilized by Robinson,²⁶ the earlier names of the fossil forms are employed.

THE TEETH THAT HAVE BEEN ATTRIBUTED TO MEGANTHROPUS AFRICANUS WEINERT

Weinert²⁷ and Remane²⁸ have attributed to *Meganthropus africanus* Weinert, represented by a fragment of right maxilla including P³-P⁴ and the alveolus of C¹, an isolated left M³ discovered either 6 or 3 kilometers away from the maxilla fragment.²⁹ Regarding this isolated M³ Remane states: "*Dass die beiden Fundstücke zur gleichen Form (Spezies) gehören, dürfte sicher sein; ob sie zum gleichen Individuum gehören, lässt sich nicht entscheiden und ist von geringer Bedeutung.*"³⁰ However, as this isolated M³ was found 3 or 6 kms. away, the question as to whether it belongs to the same individual or not is really out of consideration, as it cannot be attributed to the same individual with the maxillary fragment.³¹ Robinson, who eliminates this tooth from consideration, states regarding it: "*This tooth is therefore not considered in this discussion (a) because it is too worn to be of much diagnostic value, and (b) because it is by no means certain, color and specific gravity notwithstanding, that it does belong to M. africanus.*"³² However, it is evident that we are dealing here with a geologically ancient M³ which, as is attested by the flat attrition plane on its

²⁴ Weinert, 1950, pls. XII, XIII, XIV and pl. XV, fig. 1.

²⁵ Remane, 1951, figs. 1-4 and 1954, figs. 1-3.

²⁶ Robinson, 1954b.

²⁷ Weinert, 1950.

²⁸ Remane, 1951 and 1954.

²⁹ As is correctly noted by Robinson (1953, p. 7), Weinert gives this distance in the same paper as both 6 and 3 kilometers (see Weinert, 1950, p. 139 and p. 141).

³⁰ Remane, 1951, p. 311.

³¹ See also Robinson, 1953, p. 7.

³² *Ibid.*, p. 7.

chewing surface,³³ belongs to an early member of Hominidae. Thus, this tooth and the question of its affinities deserve some attention.

Regarding the geological age of *Meganthropus africanus* Weinert, Remane stated: "Geologisch gehören sie an die Grenze Tertiär-Diluvium. E. Hennig setzt sie in seiner 1948 veröffentlichten Tabelle in das obere Pliocän."³⁴ In a recent study Oakley, the famous British geologist, makes the following statement on the age of the Laetolil beds: "The Laetolil Beds have been correlated with Olduvai Bed I (Hopwood, in Leakey, '50, 23), but since their fauna indicates a drier biotope, and since they contain pebble-tools of a more primitive type (Kent, '41, 178), it is possible that they are slightly older and really of about the same age as the Sterkfontein breccia."³⁵ If Oakley's equation of the Laetolil beds with Sterkfontein breccia is correct, then the remains attributed to *Meganthropus africanus* Weinert would belong, according to Oakley's table,³⁶ to the later part of the Kageran stage in Africa, corresponding roughly to the upper part of Villafranchian stage of Europe.³⁷ If this attribution by Oakley is correct, then the remains attributed to *Meganthropus africanus* Weinert would belong to the upper part of the Lower Pleistocene, as now Villafranchian is generally included in the Lower Pleistocene, and would correspond in a general way to the Djetis beds of Java,³⁸ containing the remains of *Meganthropus palaeojavanicus* v. Koenigswald and *Pithecanthropus modjokertensis* (v. Koenigswald).³⁹

³³ See Remane, 1951, fig. 4.

³⁴ *Ibid.*, p. 311. See also Hennig, 1948, p. 215.

³⁵ Oakley, 1954, p. 16. Unfortunately Leakey's (1950) and Kent's (1941) reports, cited by Oakley (1954), were inaccessible to me.

³⁶ Oakley, 1954, Table 1.

³⁷ See *ibid.*, p. 17.

³⁸ See Oakley, 1954, p. 19. Regarding the time relations of *Pithecanthropus* and *Australopithecinae* von Koenigswald (1953b, p. 405) states: "We have reason to suppose that the oldest *Pithecanthropus*-types and the *Australopithecinae* are of about the same age." Regarding the time relation of Djetis beds of Java with the Kageran beds of Africa, Oakley (1954, p. 19) states: "The Djetis Beds are of Upper Villafranchian age, and therefore broadly contemporary with the Kageran beds of Africa."

³⁹ See von Koenigswald, 1949, p. 97 and 1950, p. 59; Oakley, 1954, p. 19.

The Maxillary Fragment:

Remane states regarding this maxillary fragment: "The premolars of *Meganthropus africanus* now are obviously intermediate between those of the *Pongidae* and those of the other *Hominidae*. The P^3 has three roots, as have the *Pongidae* in the most cases, but this is very exceptional in the *Hominidae*. The roots of P^4 are, as far as may be recognized, intermediate between two roots and three roots. The antero-interior extension of the buccal surface is more evident than in the premolar of any known other hominid, and the differences between P^3 and P^4 are also more evident than in the other *Hominidae*. The placing of *Meganthropus africanus* in the *Hominidae* is demonstrated by the crests and ridges of the enamel, the lowered point of the principal cusp and the alveolus of the canine, which demonstrates the existence of a smaller canine than in the *Pongidae*."⁴⁰ Regarding the estimated length measurement of the upper canine of which only the alveolus is retained, Remane states: "Für seinen mesiodistalen Durchmesser gibt die Schlifffläche am P_3 einen Ausgangspunkt. Unter Berücksichtigung der Alveolenlage kommt man auf ein Mindestmass von 10 mm (wahrscheinlich 11)".⁴¹ The mesio-distal measurements of the upper canines of the living great anthropoids and some members of the *Hominidae* are listed in Table I.

The figures listed show that the length (mesio-distal diameter) of C^1 of *Meganthropus africanus* Weinert is smaller than the minima of male *Pongo*, *Gorilla* and *Pan*. It is also below the minimum length of female *Gorilla* given by Remane.⁴² The absolute length of the upper canine of *Meganthropus africanus* Weinert is smaller than the minimum of female *Pongo* in my series, but is near the minimum for female *Pongo* measured by Remane⁴³ and Hooijer.⁴⁴ The absolute length of C^1 of *Meganthropus africanus* Weinert is also in the range of female *Pan* measured by me.⁴⁵ However, in this connection I would like to point out that my series of female chimpanzees in-

⁴⁰ Remane, 1954, p. 124.

⁴¹ Remane, 1951, p. 315.

⁴² See Remane, 1921, Table IV.

⁴³ *Ibid.*

⁴⁴ Hooijer, 1948, Table IIB.

⁴⁵ The minimum given for female *Pan* by Remane (1921, Table IV) is 10.1 mm., which is slightly higher than the smallest value in my series.

cludes a specimen of *Pan schweinfurthi* (C^1 length=10.0 mm.), which is a small species, and a specimen of *Pan paniscus* (C^1 length=9.7 mm.) which is a still smaller, dwarf species.⁴⁶ In the relatively larger species, *Pan satyrus* in my series the minimum length of the upper canines in the females is 11.2 mm., which is near but slightly larger than that of *Meganthropus africanus* Weinert.

The mesio-distal diameter of the upper canine of *Meganthropus africanus* Weinert is considerably smaller than that of the canine attributed to *Gigantopithecus blacki* v. Koenigswald, whose precise systematic position is still unsettled. In length the upper canine of *Meganthropus africanus* Weinert comes near to that of male *Plesianthropus transvaalensis* Broom, but exceeds those of *Pithecanthropus modjokertensis* (v. Koenigswald), *Africanthropus njarasensis* Weinert and the average of *Sinanthropus pekinensis* Black, although the maximum of the latter comes near to it. Furthermore, it exceeds in absolute length, the maxima of all the recent races listed.

From the account given above it is clear that in absolute length of the upper canine the ranges of the hominids and some anthropoids, particularly the female anthropoids, overlap to some extent. In view of this, for the determination of the systematic position of a fossil form, such as *Meganthropus africanus* Weinert, the size of the canine relative to those of the other teeth is of greater taxonomic value, as the anthropoids, irrespective of the differences in the body sizes of the various genera and species, have relatively larger canines and the hominids comparatively smaller canines.

The length of C' relative to those of P^3 and P^4 are listed in Table 2. From this table it is seen that the relative length of C' of *Meganthropus africanus* Weinert is far below the minima of the male and female anthropoids, and is clearly on the hominid side. In these indices *Meganthropus africanus* Weinert also falls far below those of female *Pan schweinfurthi* and *Pan paniscus*.⁴⁷ In short it can be stated

⁴⁶ See Coolidge, 1933, p. 55.

⁴⁷ These indices in one specimen of female *Pan schweinfurthi*, one female *Pan paniscus* and the minima of female and male *Pan satyrus* are as follows:

	$\frac{C^1 \text{ length} \times 100}{P^3 \text{ length}}$	$\frac{C^1 \text{ length} \times 100}{P^4 \text{ length}}$
<i>Pan schweinfurthi</i> (♀)	136.98	161.29

that in the relative size of its upper canine *Meganthropus africanus* Weinert is definitely on the hominid side, as has already been concluded by Remane.⁴⁸

When the first upper premolar of *Meganthropus africanus* Weinert is viewed from the distal side,⁴⁹ it is seen that the difference between the heights of the tips of buccal and lingual cusps, on the occlusal surface, is about the same as that of P³ of *Plesianthropus transvaalensis* Broom (specimen Sts. 1), depicted by Robinson.⁵⁰ The difference between the tips of buccal and lingual cusps of *Meganthropus africanus* Weinert and *Plesianthropus transvaalensis* Broom (specimen Sts. 1) appear to be more than those of the first upper premolars of *Paranthropus crassidens*, depicted by Broom and Robinson⁵¹ and *Sinanthropus pekinensis* (specimen 19), figured by Weidenreich.⁵² In other words, it is seen that the lingual cusp of P³ in *Meganthropus africanus* Weinert and *Plesianthropus transvaalensis* Broom is, relatively speaking, lower in height than those of *Paranthropus crassidens* and *Sinanthropus pekinensis*, that is, they are more primitive than the latter forms.

When the P³ of *Meganthropus africanus* Weinert is viewed from the distal surface,⁵³ it is seen that the buccal surface inclines strongly lingualward and downward from the base toward the tip of the buccal cusp. The degree of inclination of the buccal surface of P³ in *Meganthropus africanus* Weinert is more than that of the cast of the corresponding tooth of the type specimen of *Plesianthropus transvaalensis* Broom⁵⁴ and the specimen Sts. 1 depicted by Robinson.⁵⁵ The degree of incli-

<i>Pan paniscus</i> (⊕)	124.36	136.61
<i>Pan satyrus</i> (minimum for females)	138.82	146.42
<i>Pan satyrus</i> (minimum for males)	167.81	189.61

⁴⁸ Remane, 1954, p. 124.

⁴⁹ Remane, 1951, fig. 3a.

⁵⁰ Robinson, 1953, fig. 2B (The P³ of *Plesianthropus* in this figure is shown from the mesial side).

⁵¹ Broom and Robinson, 1952, fig. 34.

⁵² Weidenreich, 1937, pl. VIII, fig. 64 m and d.

⁵³ Remane, 1951, fig. 3a.

⁵⁴ The late Dr. R. Broom had kindly sent me in 1940 casts of the then available teeth of *Plesianthropus transvaalensis* and *Paranthropus robustus* (for these see Şenyürek, 1941). On this occasion I wish to recall the memory of this great South African palaeontologist.

⁵⁵ Robinson, 1953, fig. 2B.

nation of the buccal surface in P³ of *Meganthropus africanus* Weinert is considerably more than that of the specimen of *Paranthropus crassidens* depicted by Broom and Robinson,⁵⁶ but comes near to that of *Sinanthropus pekinensis* (specimen 19), figured by Weidenreich.⁵⁷

The inclination of the lingual surface of P³ of *Meganthropus africanus* Weinert, in distal view⁵⁸ is also more than that of the cast of the corresponding tooth of the type specimen of *Plesianthropus transvaalensis* Broom and than that of specimen Sts. 1 illustrated by Robinson.⁵⁹ In the degree of inclination of its lingual surface, P³ of *Meganthropus africanus* Weinert comes near to those of *Paranthropus crassidens* figured by Broom and Robinson⁶⁰ and *Sinanthropus pekinensis* specimen 19, depicted by Weidenreich.⁶¹ As for *Australopithecus prometheus* Dart, in the cast of the first specimen of the upper jaw (see Dart, 1949b) the buccal half of the crown of P³ is broken and unrestored.⁶² However, in P³ of this specimen the inclination of the lingual surface is less than that of *Meganthropus africanus* Weinert. The degree of inclination of both the buccal and lingual surfaces of P³ of *Meganthropus africanus* Weinert is conspicuously more than those of recent man.

It appears that in the degree of inclination of its buccal and lingual surfaces P³ of *Meganthropus africanus* Weinert is more primitive than P³ of *Plesianthropus transvaalensis* Broom, but is still not beyond

⁵⁶ Broom and Robinson, 1952, fig. 34.

⁵⁷ Weidenreich, 1937, pl. VIII, fig. 64 m and d.

⁵⁸ Remane, 1951, fig. 3a.

⁵⁹ Robinson, 1953, fig. 2B.

⁶⁰ Broom and Robinson, 1952, fig. 34.

⁶¹ Weidenreich, 1937, pl. VIII, fig. 64 m and d.

⁶² See Dart, 1949b, p. 197. On this occasion I wish to express my gratitude to Prof. Dr. R. Dart of the Witwatersrand University, in Johannesburg, who has generously supplied me with casts of the available teeth of *Australopithecus prometheus* Dart and of the juvenile specimen of *Australopithecus africanus* Dart.

Dart gives a drawing of the complete appearance of P³ of the first specimen of palate of *Australopithecus prometheus* Dart (see Dart, 1949b, fig. 1), which he has restored from the mould of the missing part in the breccia (see Dart, 1949b, p. 197), but this restoration has not been transferred to the cast.

In the second specimen of the upper jaw of *Australopithecus prometheus* Dart (see Dart, 1949c), which belongs to an older individual, as the crown of P³ is almost worn down to the base, it is not possible to compare the inclinations of the buccal and lingual surfaces of P³ with those of *Meganthropus africanus* Weinert.

the range of *Sinanthropus pekinensis* Black, which is a primitive hominid. The degree of inclination of the lingual surface of P³ of *Meganthropus africanus* Weinert, is about the same as that of *Paranthropus crassidens*, but that of the buccal surface is more primitive than that of the latter.

When P³ of *Meganthropus africanus* Weinert is viewed from the distal surface, ⁶³ it is seen that the basal part of the base of the buccal surface of the crown bulges more over the buccal surface of the roots than in the cast of P³ of the type specimen of *Plesianthropus transvaalensis* Broom and more than in the specimen Sts. 1 figured by Robinson, ⁶⁴ which is indicative of a greater development of a basal cingulum in the former. The bulge of the basal part of the buccal surface of P³ in *Meganthropus africanus* Weinert also appears to be greater than in *Paranthropus crassidens* and *Sinanthropus pekinensis*, depicted respectively by Broom and Robinson ⁶⁵ and Weidenreich. ⁶⁶ On the other hand, there does not appear to be much difference in the bulge of the base of the lingual surface, over the root, between *Meganthropus africanus* Weinert, ⁶⁷ *Plesianthropus transvaalensis* Broom ⁶⁸ and *Paranthropus crassidens*. ⁶⁹ The bulge of the base of the lingual surface in P³ of these forms appears to be more than in specimen 19 of *Sinanthropus* depicted by Weidenreich ⁷⁰ and much more than in recent man, that is they are more primitive.

The accessory ridges on the chewing surface of P³ of *Meganthropus africanus* Weinert is described by Remane as follows: "*Die Modellierung der Kaufläche ist schwach, das gilt besonders von den Leisten, doch lassen sich am Aussenhöcker zwei nach innen ziehende Wülste erkennen, die mit gemeinsamer Basis entspringen.*" ⁷¹ Regarding these ridges on the chewing surface of P³ of *Plesianthropus transvaalensis* Broom, Robinson states: "*P³ from the left side is illustrated here in figure 2. From this it is manifest that the occlusal surface of this tooth is very similar to that*

⁶³ Remane, 1951, fig. 3a.

⁶⁴ Robinson, 1953, fig. 2B.

⁶⁵ Broom and Robinson, 1952, fig. 34.

⁶⁶ Weidenreich, 1937, pl. VIII, fig. 64 m and d.

⁶⁷ Remane, 1951, fig. 3a.

⁶⁸ Robinson, 1953, fig. 2B.

⁶⁹ Broom and Robinson, 1952, fig. 34.

⁷⁰ Weidenreich, 1937, pl. VIII, fig. 64 m and d.

⁷¹ Remane, 1951, p. 313.

of the *M. africanus* tooth, but the former has a more complicated crenulation of the surface. P^3 of *Sts. 12*, on the other hand, has a similarly shaped occlusal surface which is absolutely smooth except for the simple hominid-type fissure system."⁷² From this it is clear that in the degree of the development of accessory transverse ridges on its chewing surface, P^3 of *Meganthropus africanus* Weinert falls within the range of variation of *Plesianthropus transvaalensis* Broom.

In the type specimen of *Paranthropus robustus* Broom figured by Broom,⁷³ the masticating surface of left P^3 is also slightly worn, but still a short transverse fissure is present on the buccal side of the antero-posterior furrow and just behind the transverse axis of the tooth. This fissure indicates that there were two accessory ridges on the buccal half of the chewing surface of this tooth, as in P^4 of this specimen shown here in fig. 4. Indeed, in the right P^3 , figured by Broom⁷⁴ and attributed by him to the type specimen, two ridges on the buccal side are clearly seen. Thus the configuration of the accessory ridges on the occlusal surface of P^3 of *Paranthropus robustus* Broom also comes near to that of *Meganthropus africanus* Weinert. In the presence of two accessory ridges on the buccal half of the masticating surface of P^3 , *Meganthropus africanus* Weinert also does not differ much from the upper first premolars of *Paranthropus crassidens* figured by Broom and Robinson.⁷⁵ As has been described by the late Weidenreich, P^3 of *Sinanthropus pekinensis* Black also possesses two accessory ridges on the buccal side and several weaker ones on the lingual side.⁷⁶

It is evident that in the presence of two accessory transverse ridges on the buccal side of the chewing surface of P^3 , *Meganthropus*

⁷² Robinson, 1953, p. 5. In the type specimen of *Plesianthropus transvaalensis* Broom pictured in this report (fig. 2), the chewing surface is worn, so it is not possible to detect the accessory ridges that may have been present (for the picture of this tooth see also Broom, 1946, pl. VI, fig. 33 and Gregory and Hellman, 1939, fig. 6B).

⁷³ Broom, 1946, pl. IX, fig. 86.

⁷⁴ *Ibid.*, pl. IX, fig. 86.

⁷⁵ Broom and Robinson, 1952, fig. 34, pl. 1, fig. 7 and pl. 5, fig. 20.

⁷⁶ Weidenreich, 1937, p. 37.

africanus Weinert is not more primitive than the australopithecines in general and *Sinanthropus pekinensis* Black. ⁷⁷

Regarding the crown of P³ of *Meganthropus africanus* Weinert, Remane states: "Der P³ fällt besonders durch die Vorwölbung der vorderen Buccalfläche auf (Abb. 2.) In Seitenansicht fällt die mesiale Seite der Buccalfläche vorn zunächst fast senkrecht ab, ihre tiefste Vorbuchtung erreicht sie auf der Vorderwurzel (wie bei den Anthropoiden)." ⁷⁸ When the crown of P³ of *Meganthropus africanus* Weinert, depicted by Remane, ⁷⁹ is viewed from the occlusal surface, it is seen that the most pronounced part of the basal swelling of the buccal surface is found in the mesial part of this surface, thus giving the tooth, in this view an asymmetrical appearance.

In this feature P³ of *Meganthropus africanus* Weinert reminds one of P³ of the great anthropoids, in which the buccal surface of this tooth is usually asymmetrical in occlusal view. ⁸⁰ In the asymmetry of its buccal surface, in occlusal view, P³ of *Meganthropus africanus* Weinert also approaches P³ of *Sinanthropus pekinensis* Black (specimen 19), depicted by Weidenreich. ⁸¹ Thus, although primitive, in this feature *Meganthropus africanus* Weinert is still within the range of variation of Hominidae.

In the type specimen of *Plesianthropus transvaalensis* Broom there is a median swelling on the buccal surface of the crown which courses from the tip of buccal cusp toward the mesial part of the base

⁷⁷ P³ of *Africanthropus njarasensis* Weinert (Remane, in Weinert, 1939, fig. 3) is too worn for an assessment of the accessory ridges and the photographs of P³ of *Pithecanthropus modjokertensis* v. Koenigswald (*Pithecanthropus robustus* Weidenreich) published by Weidenreich (1945, pl. 3, fig. 3) and von Koenigswald (1942, pl. 6, fig. 2) are not too clear for this purpose. Regarding the accessory ridges in the upper premolars and molars of *Pithecanthropus modjokertensis* v. Koenigswald (*Pithecanthropus robustus* Weidenreich), however, Weidenreich (1945, p. 30) makes the following general statements: "The canine pattern shows the same arrangement and development of the crests and of the lingual surface as that I described in *Sinanthropus* and the same is true of the wrinkle system of the premolars and molars. At first glance the wrinkles seem less pronounced, but when the individual teeth are compared with those of *Sinanthropus* having a corresponding degree of wear, the difference is practically nil."

⁷⁸ Remane, 1951, p. 312.

⁷⁹ *Ibid.*, fig. 2.

⁸⁰ Şenyürek, 1940, p. 15.

⁸¹ Weidenreich, 1937, pl. VIII, fig. 64 (o).

of buccal surface, but still as can be seen from fig. 2, the buccal surface of this tooth, in occlusal view, is much more symmetrical than that of *Meganthropus africanus* Weinert.⁸² In P³ of specimen Sts. 1 of this form, figured by Broom and Robinson, and Robinson, the buccal surface in occlusal view is symmetrical.⁸³ This surface is also symmetrical in P³ of the female *Plesianthropus transvaalensis* Broom,⁸⁴ found in 1936, and in that of another female specimen (Skull 6), figured by Broom and Robinson.⁸⁵ In the first upper premolars of *Paranthropus robustus*, pictured by Broom⁸⁶ and *Paranthropus crassidens*, figured by Broom and Robinson,⁸⁷ the buccal surface is more symmetrical than that of *Meganthropus africanus* Weinert.⁸⁸ Thus it is clear that in the asymmetry of its buccal surface, in occlusal view, P³ of *Meganthropus africanus* Weinert differs from the known, at least the pictured, specimens of australopithecines.

When the P³ of *Meganthropus africanus* Weinert is viewed from the buccal surface, it is seen that the highest point of enamel margin, instead of being in the middle, is, as already pointed out by Remane,⁸⁹ found in the mesial part of the buccal surface. This asymmetrical form of enamel margin in P³ of *Meganthropus africanus* Weinert recalls the condition found in the corresponding tooth of the typical anthropoids (see fig. 1).⁹⁰

Remane states regarding the height measurements of the upper premolars of *Meganthropus africanus* Weinert: "*Die Kronenhöhe, gemessen*

⁸² The more symmetrical nature of the buccal surface of P³ of the type specimen of *Plesianthropus transvaalensis* Broom is also clearly seen in the figures published by Broom (1939, fig. IA and B; 1946, pl. VI, figs. 33-34) and Gregory and Hellman (1939, fig. 6B).

⁸³ Broom and Robinson, 1950, pl. 4, fig. 17 and Robinson, 1953, fig. 2A.

⁸⁴ See Broom, 1939, fig. IB; Broom, 1946, pl. VI, fig. 34; Gregory and Hellman, 1939, fig. 4; Le Gros Clark, 1950, fig. 2A.

⁸⁵ Broom and Robinson, 1950, pl. 1, fig. 4.

⁸⁶ Broom, 1946, pl. IX, fig. 86.

⁸⁷ Broom and Robinson, 1952, fig. 34, pl. 1, fig. 7, pl. 4, fig. 17 and pl. 5, fig. 20.

⁸⁸ In the drawing of the restored P³ of the first specimen of upper jaw of *Australopithecus prometheus* Dart, also, the buccal face, in occlusal view, is shown as nearly symmetrical (see Dart, 1949b, fig. 1).

⁸⁹ Remane, 1951, p. 312 and p. 322.

⁹⁰ *Ibid.*, p. 312. For anthropoids see also Şenyürek, 1940, p. 15.

von der Spitze des Aussenhöckers bis zur tiefsten Stelle des Schmelzrandes der Buccalfläche beträgt am P³ 10.9, bei senkrechter Messung zum Mittelteil des buccalen Schmelzrandes 10.4, am P⁴ 8.4.”⁹¹ However, a scrutiny of the drawing published by Remane⁹² shows that the first measurement given by him as representing the height of the highest point of the enamel margin, is very probably an oblique measurement, thus augmenting the difference in height of enamel margin at the middle and anterior part of buccal surface. I have measured the middle and anterior heights of the crown of P³ of *Meganthropus africanus* Weinert from Remane’s drawing⁹³ according to the technique shown in fig. 1 and obtained the following values: Middle height (A-B) 10.5 mm., and anterior height (C-D) 10.75 mm. Although the measurements taken from the drawings of teeth cannot always be considered to be precise, still, as the two measurements are taken in parallel they perhaps give a better idea about the difference in height of the enamel margin at the anterior and middle parts of the buccal surface of P³, than the figures given by Remane. The index expressing the anterior height of P³ as a percentage of its middle height, in some anthropoids I had measured and in *Meganthropus africanus* Weinert is as follows :⁹⁴

		Anterior Height of P ³ × 100
		Middle Height of P ³
<i>Pongo</i> . 5 individuals	(♂ + ♀)	103.16 [100.00-106.36]
<i>Gorilla</i> . 3 individuals	♂	113.10 [104.76-119.29]
<i>Pan</i> . 4 individuals	(♂ + ♀)	106.29 [100.00-117.14]
<i>Meganthropus africanus</i> Weinert		102.38

It is clear from this list that in this index, P³ of *Meganthropus africanus* Weinert is still within the range of the living anthropoids, that is, primitive. On the other hand, in the specimen Sts. 1 of *Plesianthropus transvaalensis* Broom, figured by Robinson for comparison, the

⁹¹ Remane, 1951, p. 312.

⁹² *Ibid.*, fig. 2.

⁹³ *Ibid.*, fig. 2.

⁹⁴ Figures in parentheses show the range.

opposite condition from that observed in P³ of *Meganthropus africanus* Weinert is seen; viz., the highest point of enamel margin on the buccal surface is found behind the mid-line of the crown.⁹⁵ However, regarding the configuration of the enamel margin in P⁴ and P³ of *Plesianthropus transvaalensis* Broom, Robinson states: "In *M. africanus* P⁴ differs considerably from P³. The crown is more symmetrical and the occlusal surface is simpler. The fissure system is essentially hominid and the enamel surface is almost smooth. The buccal face is also less complicated. The buccal grooves are lightly marked and the ridges poorly developed and are only visible for a short distance mesially and distally; not almost continuous as in P³. The upward extension of the cervical line is centrally placed; the corresponding extension in P³ is situated mesialward of the center. These features may also be found among the *Plesianthropus* teeth."⁹⁶ With due regard to this statement however, in my opinion it still remains to be demonstrated whether the same degree of assymetry in the enamel margin of the buccal surface of P³ of *Meganthropus africanus* Weinert also exists in the corresponding teeth of *Plesianthropus transvaalensis* Broom.

The form of the enamel margin of the buccal surface of P³ of *Meganthropus africanus* Weinert is distinguished from that of the specimen of *Paranthropus crassidens*, figured by Broom and Robinson,⁹⁷ in which the enamel margin is seen to be symmetrical, with the highest point being in the center. In this feature P³ of *Meganthropus africanus* Weinert is also more primitive than those of the specimens of *Sinanthropus pekinensis* figured by Weidenreich.⁹⁸

In referring to P³ of *Meganthropus africanus* Weinert and that of *Plesianthropus transvaalensis* Broom, Remane states that in the latter "...the main cusp is lower."⁹⁹ Indeed, a comparison of the tip portion of the buccal cusp of P³ of *Meganthropus africanus* Weinert with

⁹⁵ Robinson, 1953, fig. 2C. Regarding the buccal face of P³ of the earlier found specimens of *Plesianthropus transvaalensis* Broom, Gregory and Hellman (1939, p. 349) stated: "In *Plesianthropus* the buccal face of the crown of P¹ (Fig. 6A) is more symmetrical (with reference to a vertical axis through the paracone) than in gorilla, orang or chimpanzee."

⁹⁶ Robinson, 1953, pp. 6-7.

⁹⁷ Broom and Robinson, 1952, fig. 34.

⁹⁸ Weidenreich, 1937, pl. VIII, figs. 64b, 65b and 68b.

⁹⁹ Remane, 1954, p. 126.

that of *Plesianthropus transvaalensis* Broom, specimen Sts. 1, figured by Robinson,¹⁰⁰ which is nearly fresh,¹⁰¹ shows that the tip portion of the buccal cusp of the former is absolutely as well as relatively higher than that of the latter. The tip portion of the buccal cusp of P³ of *Meganthropus africanus* Weinert is also relatively higher than that of the specimen of *Paranthropus crassidens*, figured by Broom and Robinson¹⁰² and higher than that of specimen 19 of *Sinanthropus pekinensis* depicted by Weidenreich.¹⁰³ On the other hand, the tip portion of the buccal cusp of P³ of *Meganthropus africanus* Weinert is relatively lower in height than those of *Limnopithecus macinnesi* Le Gros Clark and Leakey,¹⁰⁴ *Proconsul africanus* Hopwood,¹⁰⁵ *Proconsul nyanzae* Le Gros Clark and Leakey,¹⁰⁶ *Sivapithecus africanus* LeGros Clark and Leakey,¹⁰⁷ *Dryopithecus punjubicus* Pilgrim,¹⁰⁸ *Sivapithecus orientalis* Pilgrim,¹⁰⁹ *Sivapithecus sivalensis* (Lydekker),¹¹⁰ and those of the recent great apes (see fig. 1).¹¹¹ Thus, in addition to the relatively small size of the upper canine, this feature of P³ also, as has already been stated by Remane,¹¹² clearly shows that *Meganthropus africanus* Weinert is a member of Hominidae, although it represents a primitive member of this family.

¹⁰⁰ Robinson, 1953, fig. 2C.

¹⁰¹ *Ibid.*, p. 5. Regarding this tooth of *Plesianthropus*, Robinson (1953, p. 5) states: "In the small collection of *Plesianthropus* specimens there is only one (Sts. 1) in which P³ is almost unworn."

¹⁰² Broom and Robinson, 1952, fig. 34. The buccal surface of P³ of *Paranthropus robustus* Broom is shown by Broom (1946) rather sketchily together with the skull in pl. VIII, fig. 83 and together with other teeth in fig. 19. If these sketches are accurate, it would appear that the tip portion of the buccal cusp of P³ of *Paranthropus robustus* also is lower than that of *Meganthropus africanus* Weinert (see also Remane, 1951, fig. 10, b and c). However, this still has to be verified.

¹⁰³ Weidenreich, 1937, pl. VIII, fig. 64b.

¹⁰⁴ Le Gros Clark and Leakey, 1951, pl. VII, fig. 59.

¹⁰⁵ Hopwood, 1933, pl. 6, fig. 6; MacInnes, 1943, pl. 25, fig. 1.

¹⁰⁶ Le Gros Clark and Leakey, 1951, pl. IV, fig. 20.

¹⁰⁷ *Ibid.*, pl. VI, fig. 42.

¹⁰⁸ Pilgrim, 1915, pl. 3, fig. 2.

¹⁰⁹ Pilgrim, 1927, fig. 1.

¹¹⁰ Gregory, Hellman and Lewis, 1938, pl. 5, fig. A.

¹¹¹ See also Gregory, 1920, figs. 246, 251, 258 and 260; Hooijer, 1948, pl. IV, figs. 5-6.

¹¹² Remane, 1951, p. 322; Remane, 1954, p. 124. See also Vallois, 1953, p.

The buccal cingulum of P³ of *Meganthropus africanus* Weinert is described by Remane as follows: "Durch einen breiten Aussenwulst ist die Buccalfläche deutlich modelliert. Er beginnt an dem fast höckerartig ausgebildeten Ursprung der vorderen Paraconusrandleiste und begleitet, sich verbreiternd, den unteren Kronenrand, um am Ende der hinteren Paraconusleiste zu enden. Dieser Aussenwulst ist vorn und hinten deutlich abgesetzt, in der Mitte jedoch kaum gegen die sonstige Buccalfläche abgegrenzt. Im Vorderteil ist die abgrenzende Furche napffartig vertieft."¹¹³ The form of the buccal cingulum of P³ of *Meganthropus africanus* Weinert is not much different from that of *Plesianthropus transvaalensis* Broom, specimen Sts. 1, described and illustrated by Robinson¹¹⁴ and is also approached by that of P³ of *Sinanthropus pekinensis* Black, described and figured by Weidenreich.¹¹⁵

Regarding the roots of P³ of *Meganthropus africanus* Weinert, Remane states: "Der P₃ besitzt 3 Wurzeln, deren spezieller Verlauf nicht angegeben werden kann, da sie im Kiefer stecken."¹¹⁶ From the configuration of the visible parts of the buccal roots,¹¹⁷ it would appear that the two buccal roots were separate, but it is not known whether the lingual root also is completely separate.¹¹⁸ Robinson has recently stated regarding the number of roots in P³ of australopithecines: "In one specimen from Sterkfontein a single root is present but in all other known australopithecine specimens there are at least two roots. Of 13 Sterkfontein specimens only one has a double buccal root, i.e., three roots altogether, while of 19 Swartkrans specimens 14 have double buccal roots. This difference takes on even greater significance when it is remembered that the geologically older form is the more advanced in this respect."¹¹⁹ Regarding the roots of P³ of *Paranthropus robustus* Broom, from Kromdraai, Broom stated: "The tooth has three roots but the two outer ones are close together at the alveolus, but possibly they may diverge considerably in the bone. This is in

¹¹³ Remane, 1951, p. 312.

¹¹⁴ Robinson, 1953, p. 5 and fig. 2A and C.

¹¹⁵ Weidenreich, 1937, pp. 36-37 and pl. VIII, fig. 64b.

¹¹⁶ Remane, 1951, p. 314.

¹¹⁷ *Ibid.*, fig. 2.

¹¹⁸ Regarding the lingual root, Remane (1951, p. 314) states: "Die Innenwurzel ist nur an ihrer Basis sichtbar."

¹¹⁹ Robinson, 1954b, p. 187. See also Robinson, 1954a, pp. 270-271.

marked contrast to the condition in *Plesianthropus* where there are only two roots though the tip of the outer is partly bifid." ¹²⁰

P³ of the first specimen of the upper jaw of *Australopithecus prometheus* Dart, is described by Dart as possessing two roots. ¹²¹ In this feature P³ of the Makapan form agrees with the majority of *Plesianthropus transvaalensis* Broom and resembles the specimens of *Paranthropus crassidens* having only two roots, while the majority of this form possesses three roots which may be free or two of which may be united. ¹²² Thus it is clear that in root number P³ of *Meganthropus africanus* Weinert is within the range of variation of genus *Paranthropus* and is also approached by one specimen of *Plesianthropus transvaalensis* Broom, which in most cases have only two roots. In root number P³ of *Meganthropus africanus* Weinert appears to agree also with that of *Pithecanthropus modjokertensis* v. Koenigswald (*Pithecanthropus robustus* Weidenreich), which is described as being three-rooted by von Koenigswald, ¹²³ but is distinguished from that of *Sinanthropus pekinensis* Black which has two, separate or largely fused roots ¹²⁴ and also from that of *Africanthropus njarasensis* Weinert. ¹²⁵

As can be seen from Table 3, in size, as expressed by the robustness value, P³ of *Meganthropus africanus* Weinert is smaller than that of *Gorilla* of both sexes measured and is in the range of that of *Pongo*. This tooth of *Meganthropus africanus* Weinert exceeds the maximum of *Pan* measured. P³ of *Meganthropus africanus* Weinert is smaller than that of *Paranthropus robustus* and also smaller than that of *Paranthropus*

¹²⁰ Broom, 1946, p. 95.

¹²¹ Dart, 1949b, p. 198.

¹²² For the condition of roots in P³ of *Paranthropus crassidens* see Broom and Robinson, 1952, p. 38; Robinson, 1953, p. 6; Robinson, 1954b, p. 187.

¹²³ von Koenigswald, 1954, p. 85.

¹²⁴ Weidenreich, 1937, p. 37 and pl. VIII, figs. 64, 65 and 68.

¹²⁵ Regarding the roots of P³ and alveolus of P⁴ of *Africanthropus njarasensis* Weinert, Remane (in Weinert, 1939, p. 270) states: "Da der Zahn fest im Kiefer steckt, is von den Wurzeln wenig zu erkennen. Die Aussenwurzel ist sicher einheitlich, nicht geteilt; inwieweit sie mit der Innenwurzel zu einem einheitlichen Gebilde verschmolzen war, ist am P³ nicht zu erkennen, wohl aber am P⁴. Von diesem Zahn ist nämlich die Vorderwand der Alveole erhalten, sie lässt auf eine breite einheitliche Wurzel mit einer Längsfurche an der Mesialfläche schliessen."

crassidens.¹²⁶ This tooth of *Meganthropus africanus* Weinert, in size, falls fully within the range of variation of *Plesianthropus transvaalensis* Broom and exceeds that of female *Australopithecus prometheus*. It exceeds in size the specimens of *Pithecanthropus modjokertensis* v. Koenigswald and *Africanthropus njarasensis* Weinert. It also surpasses in size the average of *Sinanthropus pekinensis* Black, but falls in the upper limit of its range of variation. P³ of *Meganthropus africanus* Weinert far exceeds in size those of recent man listed.

The crown index of P³ of *Meganthropus africanus* Weinert does not distinguish it from those of some great anthropoids and hominids, the ranges of which overlap.¹²⁷ However, it is of interest to note that in crown index it falls below those of *Plesianthropus transvaalensis*, *Australopithecus prometheus*, *Paranthropus robustus* and probably also *Paranthropus crassidens*. It is also noteworthy that, although still within the range of recent man and some anthropoids, the australopithecines, *Pithecanthropus* and *Sinanthropus* have relatively high crown indices, higher on the average than those of recent man and of the anthropoids. This would indicate that in the process of reduction in size of the first upper premolar of recent man, the breadth has been diminished more than the length.

In height indices (Table 4), P³ of *Meganthropus africanus* is within the range of *Pongo*, *Gorilla* and recent man, that is, the height indices

¹²⁶ It may be noted that even the minimum length (9.3 mm.) and minimum breadth (13.4 mm.) measurements given by Broom and Robinson (1952) yield a higher robustness value than that of *Meganthropus africanus* Weinert.

¹²⁷ Very high crown indices are also found in P³ of some specimens of fossil Tertiary anthropoids. For instance according to the measurements of Pilgrim (1927), in P³ of the type specimen of *Sivapithecus sivalensis* (Lydekker) this index is 167.64 (length 6.8 and breadth 11.4 mm.) and in *Ramapithecus brevisrostris* Lewis (according to Lewis, 1934, length is 6.9 and breadth 10.3 mm.) it is 149.27. As calculated from the measurements given by Le Gros Clark and Leakey (1951) this index varies between 131.25 and 148.57 in P³ of *Proconsul nyanzae* Le Gros Clark and Leakey and from 128.76 (according to the measurements of Hopwood, 1933 and Le Gros Clark & Leakey, 1951) to 175.00 (Le Gros Clark and Leakey, 1951) in that of *Proconsul africanus* Hopwood. According to Le Gros Clark and Leakey (1951), this index amounts to 150.00 in P³ of specimen C.M.H. 6 of *Sivapithecus africanus* Le Gros Clark and Leakey. This peculiarity of some anthropoids had unfortunately been overlooked in my earlier study on the teeth of australopithecines (see Şenyürek 1941, p. 296).

do not distinguish it from those of some anthropoids and recent man. On the other hand, in height indices it exceeds the maxima of *Pan* and one specimen of *Sinanthropus pekinensis*.

As can clearly be seen from the drawing published by Remane,¹²⁸ the chewing surface of P⁴ of *Meganthropus africanus* Weinert is much smoother than that of the first upper molar.¹²⁹ In this feature P⁴ of *Meganthropus africanus* Weinert differs conspicuously from the slightly worn corresponding teeth of the type specimen of *Plesianthropus transvaalensis* Broom (fig. 2), the type specimen of *Paranthropus robustus* Broom (fig. 4) and that of the first specimen of the upper jaw of *Australopithecus prometheus* Dart (fig. 3), all of which, in spite of attrition, show more relief on the chewing surface than *Meganthropus africanus* Weinert. There appears to be more relief on the chewing surface of P⁴ of *Paranthropus crassidens* Broom and Robinson¹³⁰ than that of *Meganthropus africanus* Weinert. In the smoothness of its chewing surface, P⁴ of *Meganthropus africanus* Weinert also conspicuously diverges from that of *Sinanthropus pekinensis* Black, the chewing surface of which is wrinkled.¹³¹ Regarding the chewing surface of P⁴ of *Plesianthropus transvaalensis* Broom, Robinson states: "The fissure system is simpler than that of P³ but is not always as simple as that in *M. africanus*."¹³² Thus in this feature the maxillary fragment of *Meganthropus africanus* Weinert appears to be distinguished from *Plesianthropus transvaalensis* Broom and also the other australopithecines.

Remane states regarding the difference in the length of buccal and lingual cusps of P⁴ of *Meganthropus africanus* Weinert: "Die Kaufläche zeigt die stärksten Unterschiede gegenüber dem P³. War dort das Aussenhöcker- (Paraconus-) Gebiet mit seiner vorderen und hinteren Kante länger als der mittlere Längsdurchmesser der Zähne (9,6: 8,6 mm), so ist am P⁴ das Umgekehrte der Fall (7,4: 9,1 mm); was beim P³ die Buccalhälfte viel länger als die Lingualhälfte, so ist am P⁴ die Lingualhälfte länger, besonders ihr hinterer Innenteil (distal-labial) schiebt sich bogenartig vor.

¹²⁸ Remane, 1951, fig. 2.

¹²⁹ Robinson, 1953, p. 6.

¹³⁰ Broom and Robinson, 1952, pl. I, fig. 7 and pl. 5, fig. 20.

¹³¹ Weidenreich, 1937, p. 40 and pl. IX, figs. 77 (o) and 78 (o).

¹³² Robinson, 1953, p. 7.

*Dadurch erscheint der Innenhöcker (Protoconus) noch stärker in den Vorder-
teil des Zahnes verschoben, als es am P₃ der Fall war.*"¹³³ In this feature
P⁴ of *Meganthropus africanus* Weinert differs from that of the type
specimen of *Paranthropus robustus* Broom, in which the buccal length
exceeds the middle length (see fig. 4),¹³⁴ and approaches that of
the type specimen of *Plesianthropus transvaalensis* Broom (see fig. 2)¹³⁵
and also that of the first specimen of the upper jaw of *Australopithecus
prometheus* Dart (fig. 3). It is of interest to note that in P⁴ of *Plesianthro-
pus transvaalensis* Broom (fig. 2) and *Australopithecus prometheus* Dart
(fig. 3) also the disto-lingual section of the crown, in occlusal view,
slants forward and inward, as in *Meganthropus africanus* Weinert.¹³⁶

The buccal cingulum of P⁴ of *Meganthropus africanus* Weinert,
is described by Remane as follows: "*Der Aussenwulst ist nur an seiner
vorderen und hinteren Ansatzstelle Kennlich, vorn nur an der fast höckerarti-
gen Kante, die am Zusammentreffen von vorderer (mesialer) Randleiste
und der vorderen Paraconuskante entsteht, hinten als etwas breiterer und tiefer
reichender Wulst, der von der gleichfalls schwach höckerartig markierten
Stelle am Zusammentreffen der hinteren Paraconuskante mit der hinteren
Randleiste ausgeht. Da auch von der Paraconusspitze ein Vertikalwulst zu
der tiefsten Kronengrenze in schwachem, nach vorn gerichtetem Bogen verläuft,
erscheint die Buccalfläche in drei Wülste (Vorder- und Hinterteil des Auss-
enwulstes und Mittelwulst) und zwei dazwischenliegende Täler zerlegt.
Die Täler erstrecken sich nur auf den oberen Teil, d.h. den der Kaufläche
benachbarten Teil des Zahnes.*"¹³⁷ In other words, the manifestation
of cingulum in P⁴ is weaker than that of the first upper premolar.¹³⁸
As far as can be judged from the drawing published by Remane,¹³⁹
the buccal cingulum in P⁴ of *Meganthropus africanus* Weinert appears
to be of about the same form and degree of development as that of
Sinanthropus pekinensis specimen 25, depicted by Weidenreich.¹⁴⁰

¹³³ Remane, 1951, p. 314.

¹³⁴ See also Gregory and Hellman, 1939, fig. 9.

¹³⁵ See *ibid.*, fig. 6B. See also Robinson, 1953, p. 7.

¹³⁶ See Remane, 1951, fig. 2.

¹³⁷ *Ibid.*, p. 314.

¹³⁸ See also Robinson, 1953, pp. 6-7.

¹³⁹ Remane, 1953, fig. 2.

¹⁴⁰ Weidenreich, 1937, pl. IX, fig. 77.

When the drawing ¹⁴¹ of the buccal surface of P⁴ of *Meganthropus africanus* Weinert is examined it is seen that the highest part of the enamel margin forms a nearly triangular projection, the tip of which, as has been noted by Remane ¹⁴² and Robinson, ¹⁴³ is almost in the middle of this surface. The enamel margin of the buccal surface of P⁴ of *Meganthropus africanus* Weinert corresponds to Pedersen and Thyssen's¹⁴⁴ type 5, that is there is a rather strong degree of enamel extension. The degree of enamel extension is about the same in P⁴ of *Paranthropus crassidens*, depicted by Broom and Robinson ¹⁴⁵ and, as far as can be judged from the cast, somewhat less in P⁴ of the type specimen of *Plesianthropus robustus* Broom which corresponds to Pedersen and Thyssen's type 4. ¹⁴⁶

As can be seen from the drawing published by Remane, in P⁴ of *Meganthropus africanus* Weinert the visible parts of the two buccal roots are fused.¹⁴⁷ For the condition of the apical parts of the buccal roots, Remane states: "Ob sich diese beiden Pfeiler am Wurzelende völlig trennen, Kann nicht entschieden werden, da dieser Bezirk des Vorderpfeilers im Knochen eingebettet ist."¹⁴⁸ Remane does not state whether the lingual root is completely free from the buccal roots and whether it is divergent.¹⁴⁹ In the condition of its buccal roots, P⁴ of *Meganthropus africanus* Weinert seems to differ from that of *Paranthropus robustus* Broom in which there appear to be two separate buccal roots.¹⁵⁰ In the specimen of P⁴ of *Paranthropus crassidens*, figured by Broom

¹⁴¹ Remane, 1951, fig. 2.

¹⁴² *Ibid.*, p. 314.

¹⁴³ Robinson, 1953, p. 7.

¹⁴⁴ Pedersen and Thyssen, 1942 (cited by Pedersen, 1949). The classification of Pedersen and Thyssen, (1942) is described and illustrated by Pedersen (1949, p. 74 and pl. 18, figs. 96-107).

¹⁴⁵ Broom and Robinson, 1952, fig. 35.

¹⁴⁶ In the cast of the type specimen of *Paranthropus robustus* Broom in my possession the basal part of the crown is not reproduced. In P⁴ of the cast of *Australopithecus prometheus* Dart at my disposal, the enamel margin of the buccal surface is not too clear, but still from this cast it appears that this margin is strongly convex toward the roots (see also Dart, 1949b, fig. 1).

¹⁴⁷ Remane, 1951, fig. 2 and p. 314.

¹⁴⁸ *Ibid.*, p. 314.

¹⁴⁹ See *ibid.*, p. 314.

¹⁵⁰ Broom, 1946, p. 96 and fig. 19 B.

and Robinson,¹⁵¹ the two buccal roots are fused in their lower two-thirds and free in the apical third. Although the condition of the apical parts of the two buccal roots of P⁴ of *Meganthropus africanus* Weinert is not known, it is nevertheless clear that this tooth of *Paranthropus crassidens* referred to comes closer to that of *Meganthropus africanus* Weinert than that of *Paranthropus robustus*.¹⁵² Regarding the condition of the roots in P⁴ of the type and female specimens of *Plesianthropus transvaalensis*, Broom stated: "The roots of the right second premolar are seen in section. As in the first premolar there are only two roots, but probably as in the first premolar the outer root is bifurcated near its tip. The roots are widely divergent.

The second premolar is lost from the female maxilla, but from the ridge seen on the outer side of the bone the outer root appears to have been single even to its tip."¹⁵³ In his study published in 1953, Robinson makes the following statement regarding the roots of P⁴ in a specimen of *Plesianthropus transvaalensis*: "In only one case a little can be seen of the buccal roots of P³ and P⁴ and here there is also a marked similarity to *M. africanus*. That is, two buccal roots are present in both teeth but they are either partly fused or closely approximated in P⁴ but not in P³."¹⁵⁴ Although in his recent studies Robinson¹⁵⁵ does not describe the condition of the roots in P⁴ of *Plesianthropus transvaalensis*, still from the information available it would appear that in the condition of its roots P⁴ of *Meganthropus africanus* Weinert is in the range of variation of *Plesianthropus*.

In the condition of its roots, P⁴ of *Meganthropus africanus* Weinert differs from that of *Sinanthropus pekinensis* in which there is only one main buccal root which is fused with the lingual root.¹⁵⁶

¹⁵¹ Broom and Robinson, 1952, fig. 35.

¹⁵² Broom and Robinson (1952, p. 40) state regarding the roots in P⁴ of *Paranthropus crassidens*: "Roots are preserved in three specimens. Two have the root arrangement illustrated, which is exactly the same as that of the first premolar illustrated, i.e. three roots with the mesiobuccal and the lingual ones fused for all, or most, of their length. The other has three separate roots; a mesiobuccal, a distobuccal and a lingual."

¹⁵³ Broom, 1946, p. 59.

¹⁵⁴ Robinson, 1953, p. 7.

¹⁵⁵ Robinson, 1954a and b. As for *Australopithecus prometheus*, Dart (1949b) does not describe the condition of the roots in P⁴.

¹⁵⁶ Weidenreich, 1937, p. 40, pl. IX, fig. 75 and pl. XXII, fig. 214.

The size of P⁴ of *Meganthropus africanus* Weinert, as can be seen from Table 5, is smaller than that of *Gorilla*, in the range of *Pongo* and larger than the maximum of *Pan* listed. It is considerably smaller than those of *Paranthropus robustus* and *Paranthropus crassidens*¹⁵⁷ and is in the range of that of *Plesianthropus transvaalensis*. This tooth of *Meganthropus africanus* Weinert is only slightly smaller than that of *Australopithecus prometheus* Dart which is also within the range of variation of *Plesianthropus* in size. On the other hand, in size, P⁴ of *Meganthropus africanus* Weinert exceeds that of *Pithecanthropus modjokertensis* v. Koenigswald (*Pithecanthropus robustus* Weidenreich) and the maxima of *Sinanthropus pekinensis* and of the recent men listed.

The crown index does not distinguish P⁴ of *Meganthropus africanus* Weinert from those of some anthropoids and hominids, the ranges of which overlap to a great extent. The crown index of P⁴ of *Meganthropus africanus* Weinert is within the range of variation of *Plesianthropus transvaalensis* Broom but is lower than that of *Paranthropus robustus* and *Paranthropus crassidens*, at least lower than that of some specimens of the latter. It is also of interest to note that P⁴ of the australopithecines, *Pithecanthropus* and *Sinanthropus* tend to have, on the average, higher crown indices than the averages of recent men listed, although their ranges overlap to a great extent.

An examination of Table 6 reveals that in height indices, P⁴ of *Meganthropus africanus* Weinert falls within the range of the great anthropoids. In height-length index it falls below the minima of all the hominids, fossil and recent listed.¹⁵⁸ The same is true also for the height-breadth index, with the only exception of the somewhat worn P⁴ of *Pithecanthropus modjokertensis* v. Koenigswald. It would appear that in height indices P⁴ of *Meganthropus africanus* Weinert comes nearer to those of some anthropoids than to those of the hominids, although the differences separating it from the minima of hominids are not great.

¹⁵⁷ Even the robustness value calculated from the minimum length (9.2 mm.) and breadth (14.7 mm.) given for P⁴ of *Paranthropus crassidens* by Broom and Robinson (1952) is higher than that of *Meganthropus africanus* Weinert.

¹⁵⁸ It is to be noted that among the recent men listed the lowest average height indices are found in Bushman. As I stated before (Şenyürek, 1952, p. 169), this Bushman series, measured by Drennan (1929) probably includes some worn teeth.

As Remane¹⁵⁹ and Robinson¹⁶⁰ have referred to the differences existing between P³ and P⁴ of *Meganthropus africanus* Weinert, I will only draw attention here to the difference observed in the length of the buccal surfaces of these teeth, which is not brought out by the indices listed.¹⁶¹ An examination of the drawing published by Remane¹⁶² shows that in *Meganthropus africanus* Weinert the buccal surface proper of the crown of P³ is considerably longer than that of P⁴, which is an anthropoid character. In this feature *Meganthropus africanus* Weinert conspicuously differs from *Paranthropus robustus*,¹⁶³ *Paranthropus crassidens*¹⁶⁴ and *Australopithecus prometheus*.¹⁶⁵ In the preponderance of the length of the buccal surface proper of P³ over that of P⁴, *Meganthropus africanus* Weinert also differs from the type specimen (fig. 2)¹⁶⁶ and skull 7¹⁶⁷ of *Plesianthropus transvaalensis*, although in this feature this form would seem to come nearer to *Meganthropus africanus* than the other australopithecines.

The measurements of P³ relative to those of P⁴ are listed in Table 7. In the index expressing the length of P³ as a percentage of that of P⁴, *Meganthropus africanus* Weinert¹⁶⁸ does not differ from some anthropoids and hominids. In this index *Meganthropus africanus* Weinert differs from *Australopithecus prometheus* and *Paranthropus crassidens* in which P³ is shorter than P⁴. In this index it is approached by some specimens of *Plesianthropus transvaalensis* which also shows a

¹⁵⁹ Remane, 1951, p. 312 and p. 314; 1954, pp. 123-124.

¹⁶⁰ Robinson, 1953, pp. 6-7.

¹⁶¹ The length indices $\frac{P^3 \text{ length} \times 100}{P^4 \text{ length}}$ listed in Table 7, do not clearly

bring out this difference as the maximum length of P³ and P⁴ do not necessarily occur on the buccal surface proper but may be found further lingualward or in the middle of the tooth.

¹⁶² Remane, 1951, fig. 2.

¹⁶³ Broom, 1946, pl. IX, fig. 86.

¹⁶⁴ Broom and Robinson, 1952, pl. 1, fig. 7 and pl. 5, fig. 20; Robinson, 1952, fig. 3.

¹⁶⁵ See Dart, 1949b, fig. 1.

¹⁶⁶ Gregory and Hellman, 1939, fig. 6A-B; Broom, 1946, pl. VI, fig. 33.

¹⁶⁷ Broom and Robinson, 1950, pl. I, fig. 4.

¹⁶⁸ In comparing the measurements of the upper premolars of *Meganthropus africanus* Weinert, Robinson (1953, p. 2) lists the median length of P³ which is shorter than that of P⁴ and also yields a smaller module for P³ than that of P⁴.

tendency to have a shorter P^3 than P^4 . It is difficult to state anything definite regarding *Paranthropus robustus*, as the length measurements given by Broom ¹⁶⁹ and Robinson ¹⁷⁰ yield two different indices.

In the index expressing the buccal height ¹⁷¹ of P^3 as a percentage of that of P^4 , according to the information available, *Meganthropus africanus* Weinert, would appear to be nearer to the anthropoids than to the hominids listed.

In the index expressing the robustness value of P^3 as a percentage of that of P^4 , *Meganthropus africanus* Weinert is in the range of anthropoids and hominids. It is interesting to note that in this index, the australopithecines, with the only exception of the type specimen of *Plesianthropus transvaalensis* calculated from the measurements given by Gregory and Hellman, ¹⁷² fall below the averages of the hominids, fossil and recent, listed; this tendency being most pronounced in the case of *Paranthropus crassidens*, followed by *Australopithecus prometheus*. In this index *Meganthropus africanus* Weinert is conspicuously distinguished from *Paranthropus robustus*, *Paranthropus crassidens* and *Australopithecus prometheus*, in all of which P^3 is smaller than P^4 . In this index it also differs from the available specimens of *Plesianthropus transvaalensis* Broom, with the only exception of the measurements of the type specimen given by Gregory and Hellman. ¹⁷³ According to the measurements of Gregory and Hellman, ¹⁷⁴ both the length and breadth measurements of P^3 exceed those of P^4 . I have a cast of the type specimen of *Plesianthropus transvaalensis* (fig. 2), which had been generously sent to me by the late Dr. Broom in 1940. In this cast the length of P^3 is greater than that of P^4 , but the breadth of the latter far exceeds that of the former, yielding a higher robustness value. In the measurements of this type specimen given by

¹⁶⁹ Broom, 1946, pp. 95-96.

¹⁷⁰ Robinson, 1953, p. 2.

¹⁷¹ The height used is the middle height.

¹⁷² Gregory and Hellman, 1939, p. 347.

¹⁷³ *Ibid.*

¹⁷⁴ According to Gregory and Hellman (1939, p. 347) the length and breadth measurements of P^3 are respectively 9.50 and 12.60 mm. and the corresponding dimensions of P^4 are 8.70 and 12.50 mm.

Broom¹⁷⁵ and Robinson¹⁷⁶ the breadth of P⁴ also exceeds that of P³, yielding again a greater robustness value than in the latter. In view of these, it seems possible that there may have been a recording error in the measurements of the type specimen of *Plesianthropus transvaalensis* given by Gregory and Hellman.¹⁷⁷ Thus in possessing a larger P³ than P⁴, *Meganthropus africanus* Weinert appears to differ from all the known australopithecines.

The Third Upper Molar :

The left M³ from the Serengeti district attributed to *Meganthropus africanus* Weinert by Weinert¹⁷⁸ and Remane¹⁷⁹ is a four-cusped tooth, which is worn in the human fashion.¹⁸⁰ Regarding this tooth Remane states: "*In seiner Form entspricht er etwa den Sinanthropus-Molaren. Der Metaconus ist-wie es gelegentlich bei Mensch und Anthropoiden vorkommt-klein, der Hypoconus weit vorragend.*"¹⁸¹ As can be seen from the drawings published by Remane,¹⁸² this third upper molar differs from those of *Plesianthropus transvaalensis*,¹⁸³ the type specimen of *Paranthropus robustus* Broom and *Paranthropus crassidens*¹⁸⁴ in having, in mesial or distal views, a less inclined lingual surface. The inclinations of both the lingual and buccal surfaces of this tooth, in mesial or distal views, are, on the other hand, near those of the third upper molar of *Sinanthropus pekinensis*, figured by Weidenreich.¹⁸⁵

As has been described and illustrated by Remane,¹⁸⁶ in this third upper molar from the Serengeti district the mesio-buccal and the lingual roots are fused to a large extent and the two buccal roots are relatively short. In having its mesio-buccal and lingual roots

¹⁷⁵ Broom, 1939, pp. 305-306; Broom, 1946, pp. 58-59.

¹⁷⁶ Robinson, 1953, p. 2.

¹⁷⁷ Gregory and Hellman, 1939, p. 347.

¹⁷⁸ Weinert, 1950.

¹⁷⁹ Remane, 1951 and 1954.

¹⁸⁰ See Remane, 1951, fig. 4.

¹⁸¹ *Ibid.*, p. 315.

¹⁸² *Ibid.*, fig. 4b-c.

¹⁸³ See Broom, 1946, pl. VI, figs. 45, 48 and 49.

¹⁸⁴ See Broom and Robinson, 1952, fig. 38.

¹⁸⁵ Weidenreich, 1937, pl. XVI, fig. 135.

¹⁸⁶ Remane, 1951, pp. 315-316 and fig. 4: *

fused to a large extent, this tooth differs from the third upper molars of *Plesianthropus transvaalensis* and *Paranthropus crassidens*, figured respectively by Broom¹⁸⁷ and Broom and Robinson,¹⁸⁸ in which these roots are not united, and approach some specimens of *Sinanthropus pekinensis* depicted by Weidenreich.¹⁸⁹

Regarding the pulp cavity of this third upper molar, Remane states: "*Die Pulpa war also offenbar grösser als beim rezenten Menschen, aber nur etwa so gross wie bei Sinanthropus, nicht vom voll 'taurodonten' Typus.*"¹⁹⁰ From this description it would appear that this third upper molar presents a moderate degree of taurodontism, which is characteristic of *Sinanthropus*¹⁹¹ and also appears to be the case in M^2 of *Africanthropus njarasensis* Weinert.¹⁹² The occurrence of tauro-

¹⁸⁷ Broom, 1946, pl. VI, figs. 45, 48 and 49. The tooth shown in pl. VI, fig. 5 by Broom (1946), is the one first described by Shaw (1940) which was subsequently attributed to *Plesianthropus transvaalensis* by Broom (1946, p. 63 and p. 101). As can be seen from fig. 5, in M^3 of the type specimen of *Plesianthropus transvaalensis*, behind the crista obliqua, there is a secondary ridge (see Shaw, 1940, p. 150), that connects the hypocone with the metacone, in which this tooth resembles the upper molars of some forms of *Dryopithecus* (see Schlosser, 1902, pl. I, fig. 2; Gregory and Hellman, 1926, fig. 5B; Pilgrim, 1915, pl. 3, fig. 1). This secondary ridge (see Gregory and Hellman, 1939, fig. 11 and Broom, 1946, pl. IX, fig. 86) is greatly reduced or lost in M^3 of the type specimen of *Paranthropus robustus*, which appears to be the case also in M^3 of *Paranthropus crassidens* (see Broom and Robinson, 1952, fig. 38). A glance at fig. 6 will show that in the left M^3 from Sterkfontein described by Shaw (1940), also there is a curved ridge extending from the hypocone toward the disto-buccal corner of the crown, toward a small wrinkle at this corner, the two being separated by a short furrow. This structure described no doubt represents a somewhat reduced secondary ridge, which is better developed in M^3 of the type specimen of *Plesianthropus transvaalensis*. The presence of this secondary ridge further confirms the late Broom's (1946) conclusion that this tooth described by Shaw (1940) belongs to *Plesianthropus*.

¹⁸⁸ Broom and Robinson, 1952, fig. 38. Regarding the buccal roots of a specimen of M^3 of *Paranthropus crassidens*, Broom and Robinson (1952, p. 50) state: "*In a third tooth only the buccal roots are preserved and these are appreciably smaller and shorter than are those of the other two third molars.*"

¹⁸⁹ Weidenreich, 1937, pl. XVI, fig. 135.

¹⁹⁰ Remane, 1951, p. 316.

¹⁹¹ Weidenreich, 1937, pp. 103-109.

¹⁹² Remane, in Weinert, 1939, p. 303. It is also of interest to note that according to Shaw (1940, p. 149) a third upper molar from Sterkfontein, described by him but subsequently attributed to *Plesianthropus transvaalensis* by Broom (1946), is also taurodont.

dontism in this third upper molar from the Serengeti district, in *Sinanthropus pekinensis* and *Africanthropus njarasensis* shows that a moderate degree of taurodontism is a characteristic of the primitive hominids, as has been concluded.¹⁹³

The measurements of the third upper molars are listed in Table 8. As the tooth from the Serengeti district is worn, which especially affects the median length (10.1 mm.),¹⁹⁴ in this table the maximum length of the tooth, occurring on the inner side according to Remane,¹⁹⁵ is utilized. The robustness value of the Serengeti tooth is smaller than those of all available specimens of *Plesianthropus transvaalensis*, *Paranthropus robustus* and *Paranthropus crassidens*. The Serengeti tooth, in size, exceeds those of *Sinanthropus pekinensis* and the recent hominids listed. However, it is to be noted that the maximum robustness value of the East Greenland Eskimos is only slightly less than that of the Serengeti molar. So it appears that some exceptionally large teeth of recent man may come near to the Serengeti molar in size. In crown index the Serengeti tooth is in the range of variation of both anthropoids and hominids.

From the account given above it is clear that P³ and P⁴ of *Meganthropus africanus* Weinert are, in size, in the range of *Plesianthropus transvaalensis*, while the M³ from the Serengeti district is much smaller than the minimum of *Plesianthropus transvaalensis*. Although, as is known, the third upper molar of the anthropoids and hominids is a variable tooth, still it is to be noted that relative to the upper premolars from the Serengeti district, M³ from the same region is much smaller, comparatively speaking, than the third upper molars of *Plesianthropus transvaalensis*, *Paranthropus robustus* and even most individuals of *Sinanthropus pekinensis*.¹⁹⁶ Thus, the relatively small size of this M³, would be against its inclusion in the same species with the maxillary fragment from the same region, designated as *Meganthropus africanus*. The relatively small size of this tooth, together with the fusion of its mesio-buccal and lingual roots and its general

¹⁹³ Şenyürek, 1939, p. 128.

¹⁹⁴ Remane, 1951, p. 315.

¹⁹⁵ *Ibid.*, p. 315.

¹⁹⁶ In the following list the robustness values of the third upper molars are expressed as percentages of those of P³ and P⁴:

resemblance to M^3 of *Sinanthropus pekinensis*, suggests that it may belong to a form more advanced from the phylogenetic standpoint than the maxillary fragment from the Serengeti district labelled as *Meganthropus africanus* by Weinert¹⁹⁷ and Remane¹⁹⁸ and *Plesianthropus transvaalensis*.

SYSTEMATIC POSITION OF THE REMAINS ATTRIBUTED TO MEGANTHROPUS AFRICANUS WEINERT

The comparisons that have been made clearly show that the maxillary fragment from the Serengeti District of Tanganyika Territory is a member Hominidae that comes nearer to the Australopithecinae than to the other hominids. The genera and species of Australopithecinae, which is a subfamily of the Family Hominidae, have so far been variously classified by various authors.¹⁹⁹ Among the classifications of South African Australopithecinae advanced, that

	Robustness value of $M^3 \times 100$ Robustness value of P^3	Robustness value of $M^3 \times 100$ Robustness value of P^4
Teeth from Serengeti District, attributed to <i>Meganthropus africanus</i> by Weinert & Remane. After the measurements of Remane, 1951.	120.00	124.57
<i>Plesianthropus transvaalensis</i> . Type. After the measurements of Şenyürek, 1941.	177.17	175.98
<i>Paranthropus robustus</i> . Type. After the measurements of Broom, 1946.	156.79	141.42
<i>Sinanthropus pekinensis</i> . Individual II. After the measurements of Weidenreich, 1937.	—	122.00
<i>Sinanthropus pekinensis</i> . Individual L II. Right side. After the measurements of Weidenreich, 1937.	162.47	160.13
<i>Sinanthropus pekinensis</i> . Individual OI. After the measurements of Weidenreich, 1937.	132.00	151.17
¹⁹⁷ Weinert, 1950.		
¹⁹⁸ Remane, 1951.		
¹⁹⁹ See Broom, 1950, p. 12; Mayr, 1950, pp. 113-114; Washburn and Patterson, 1951, p. 651; Robinson 1954b, p. 169,		

proposed recently by Robinson²⁰⁰ who recognizes two genera, viz., *Paranthropus* and *Australopithecus* appears to fit the situation quite satisfactorily, with the exception of Serengeti maxilla.

The premolars of the maxillary fragment from the Serengeti district differ conspicuously from those of the genus *Paranthropus* (including *Paranthropus robustus* and *Paranthropus crassidens*) in size and in a number of morphological features, as discussed, so there cannot be any doubt that it does not belong to this genus. In size and also in some morphological features the upper premolars of the Serengeti maxilla come nearer to those of *Australopithecus*,²⁰¹ than to *Paranthropus*. But still a careful study reveals numerous important differences. For the sake of clearness in the comparisons made below the original names of the fossil forms now included in genus *Australopithecus* by Robinson²⁰² are utilized together with the new nomenclature proposed by this author.

As the skull of *Australopithecus africanus* Dart from Taungs, now called *Australopithecus africanus africanus* by Robinson²⁰³ is that of a juvenile individual in whom the upper premolars had not yet replaced the milk molars, a comparison between the Serengeti maxilla and this Taungs find is not possible. The Serengeti maxilla differs from that of *Australopithecus prometheus* Dart, now designated *Australopithecus africanus transvaalensis* by Robinson,²⁰⁴ in the stronger inclination of the buccal surface of P³, in having 3 roots in this tooth, in the smoothness of the chewing surface of P⁴, in the preponderance of the buccal surface of P³ over that of P⁴ and in having a P³ that is larger than P⁴. The Serengeti maxilla is distinguished from that of *Plesianthropus transvaalensis* Broom, now included in *Australopithecus africanus transvaalensis* by Robinson,²⁰⁵ in the stronger inclination of the buccal and lingual surfaces of P³, in the stronger bulge at the base of the buccal surface of this tooth, in the assymetry of the buccal surface of P³ in occlusal view, in the higher tip of the buccal cusp

²⁰⁰ Robinson, 1954a, pp. 269-270; Robinson, 1954b, p. 196.

²⁰¹ In the sense used by Robinson, 1954b.

²⁰² *Ibid.*, p. 196.

²⁰³ *Ibid.*, p. 196.

²⁰⁴ *Ibid.*, p. 196.

²⁰⁵ *Ibid.*, p. 196.

of P³, probably in the assymetry of the enamel margin of the buccal surface of this tooth, in the smoothness of the chewing surface of P⁴, in the preponderance of the length of buccal surface proper of P³ as compared with that of P⁴, and in the larger size of P³ than that of P⁴. These differences which distinguish it from *Australopithecus prometheus* Dart and *Plesianthropus transvaalensis* Broom clearly show that the Serengeti maxilla cannot be placed in a subspecies of *Australopithecus africanus*, viz., *Australopithecus africanus transvaalensis*, as has been done by Robinson²⁰⁶ and not even in genus *Australopithecus*.

In the greater inclination of the buccal surface of P³ in the assymetry of the buccal surface of P³ in occlusal view, probably in the assymetry of the enamel margin of the buccal surface of P³, in the smoothness of the chewing surface of P⁴, in the lower crown index of P³, in the larger length of the buccal surface proper of P³ than that of P⁴ and in the larger size of P³ as compared with P⁴, the Serengeti maxilla falls beyond the ranges of variation of the genera *Paranthropus* and *Australopithecus*. In my opinion the conspicuous differences which distinguish the Serengeti maxilla, labelled as *Meganthropus africanus* by Weinert,²⁰⁷ from *Paranthropus* and *Australopithecus* entitle it to a separate generic rank. Thus, taking the generic name used by Hennig²⁰⁸ who did not add to it a specific name, and the specific name employed by Weinert,²⁰⁹ I propose to rename this maxillary fragment from the Serengeti district as *Praeanthropus africanus*.

By analogy with the South African australopithecines, who had adopted a bipedal gait, it may be supposed that *Praeanthropus africanus* also had assumed the bipedal posture in his locomotion.

As the Kageran beds of East Africa, according to Oakley,²¹⁰ appear to correspond in age roughly to the Djetis beds of Java, which have yielded the remains of *Meganthropus palaeojavanicus* and *Pithecanthropus modjokertensis*, *Praeanthropus africanus* may not be considered to be the direct ancestor of the more advanced Pleistocene hominids.

²⁰⁶ *Ibid.*, p. 196.

²⁰⁷ Weinert, 1950, p. 139.

²⁰⁸ Hennig, 1943, p. 214.

²⁰⁹ Weinert, 1950, p. 139.

²¹⁰ Oakley, 1954, p. 19.

It would seem that *Praeanthropus africanus* probably represents a somewhat modified survivor of a Pliocene form that might have been related to the direct ancestors of the more advanced early Pleistocene hominids.

The isolated third upper molar from the Serengeti District also belongs to a member of Hominidae, but probably to a form more advanced from the phylogenetic standpoint than *Praeanthropus africanus* and also more advanced than *Australopithecus* and *Paranthropus*. It appears to me not improbable that this isolated molar might have belonged, strictly morphologically speaking, to a form intermediate in a general way between *Praeanthropus africanus*, *Australopithecus* and *Paranthropus* on the one hand and *Pithecanthropus*, *Sinanthropus* and *Africanthropus* level on the other. However, whether this is so or not can be settled only when more specimens from the Laetolil beds of East Africa are brought to light.

Broom²¹¹ and Dart²¹² have already expressed the opinion that *Australopithecus* had made use of some sort of weapons in obtaining his food. Broom has also deduced that he "hunted in packs."²¹³ In a more recent article, Dart infers that *Australopithecus* had utilized the ungulate humeri found in the same breccia to kill his prey.²¹⁴ Bartholomew and Birdsell, in an interesting paper published in 1953, infer from the small size of the canines and the hominid features of their dentitions that australopithecines had made use of some weapons.²¹⁵

We have already seen that *Praeanthropus africanus* possessed a relatively small canine. From this, following Bartholomew and Birdsell's line of reasoning, it may be assumed that in securing his food, he probably relied on the use of some weapons of bone, wood or stone.

It has been known for some time that the Kageran beds of East Africa contained "Pebble tools" of Kafuan culture.²¹⁶ Leakey states

²¹¹ Broom, 1934, p. 140; Broom, 1946, p. 28.

²¹² Dart, 1940, p. 178.

²¹³ Broom, 1946, p. 31; see also Broom, 1934, p. 140.

²¹⁴ Dart, 1949a, p. 12.

²¹⁵ Bartholomew and Birdsell, 1953, p. 490.

²¹⁶ See Leakey, 1953, p. 66.

regarding the Kafuan pebble tools: "A proportion of the forms attributed to the earliest Kafuan culture (a term first used by E. J. Wayland in Uganda) are not unquestionably of human workmanship, but there is no doubt whatsoever about the later Kafuan forms, nor of the Oldowan (see fig. 5) culture types which are developed from them."²¹⁷ Thus the question arises as to whether these pebble tools might belong to *Praeanthropus africanus* and to the form represented by the isolated molar. However, while *Praeanthropus* and the form represented by the isolated third upper molars probably made use of some sort of weapon, it is difficult, at the present stage of our knowledge, to state anything definite in this regard, till they are found in association with these pebble tools. This question will be settled only when more extensive researches are carried out in the Kageran beds of East Africa. Till then I prefer to leave the question of ownership of these pebble tools as an open one.

CONCLUSION

1. The maxillary fragment from the Serengeti district of Tanganyika Territory, designated as *Meganthropus africanus* by Weinert²¹⁸ and Remane,²¹⁹ in the morphology of its teeth comes closer to the australopithecines of South Africa than to the other hominids. But still this form differs from *Australopithecus* and *Paranthropus* in a number of features which, in my opinion, entitle it to a separate generic rank. I propose to rename this form, which belongs to the family Hominidae, as *Praeanthropus africanus*.²²⁰

2. The isolated third upper molar from the Serengeti district, found 6 or 3 kilometers away from the maxillary fragment, also belongs to Hominidae, but probably to a form more advanced from the morphological standpoint than *Praeanthropus africanus*, *Australopithecus* and *Paranthropus*.

²¹⁷ *Ibid.*, p. 66.

²¹⁸ Weinert, 1950, p. 139.

²¹⁹ Remane, 1951, p. 311.

²²⁰ The generic name is after Hennig (1948) and the specific name is after Weinert (1950).

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EXPLANATION OF THE FIGURES

- Fig. 1. The buccal view of P³ of a female *Gorilla*. Enlarged about twice. Drawn from original specimen.
- Fig. 2. Occlusal view of P³, P⁴, M¹ and M² of *Plesianthropus transvaalensis* Broom (*Australopithecus africanus transvaalensis*). Enlarged about twice. Drawn from cast.
- Fig. 3. Occlusal view of P³, P⁴, M¹ and M² of *Australopithecus prometheus* Dart (*Australopithecus africanus transvaalensis*). Enlarged about twice. Drawn from cast.
- Fig. 4. Occlusal view of P⁴, M¹ and M² of *Paranthropus robustus* Broom (*Paranthropus robustus robustus*). Enlarged about twice. Drawn from cast.²²¹
- Fig. 5. Occlusal view of M³ of *Plesianthropus transvaalensis* Broom (*Australopithecus africanus transvaalensis*). Enlarged about twice. Drawn from cast (Upper part of the lingual root also is shown).
- Fig. 6. Occlusal view of M³ of *Plesianthropus transvaalensis* Broom (*Australopithecus africanus transvaalensis*). The tooth first described by Shaw [1940]. Enlarged about twice. Drawn from cast.



²²¹ In this drawing the contact surface between M¹ and M² appears narrower than it actually is.

TABLE I
The Mesio - Distal Diameter of the Upper Permanent Canine¹

	Average	Range
<i>Pongo</i> (♂). Şenyürek.	[5] 17.51	15.70-21.00
<i>Pongo</i> (♀). Şenyürek.	[8] 13.01	12.00-14.00
<i>Gorilla</i> (♂). Şenyürek.	[12] 22.47	19.00-25.80
<i>Gorilla</i> (♀). Şenyürek.	[1] 16.90 ²	—
<i>Pan</i> (♂). Şenyürek.	[3] 14.38	14.20-14.60
<i>Pan</i> (♀). Şenyürek.	[8] 11.56	9.70-13.70
<i>Pan</i> (♂ + ♀) ³ . Şenyürek.	[12] 12.40	9.70-14.60
<i>Gigantopithecus blacki</i> v. Koenigswald. von Koenigswald, 1952.	[1] 13.10	—
<i>Meganthropus africanus</i> Weinert. Remane, 1951.	10.00-11.00	—
<i>Plesianthropus transvaalensis</i> Broom (♂). Broom and Robinson, 1950.	10.90 (Prob. 11.30)	—
<i>Plesianthropus transvaalensis</i> Broom. S2 (♀). Broom, 1939.	8.80 (Est. 9.20)	—
<i>Plesianthropus transvaalensis</i> Broom. S2 (♀). Broom, 1946.	8.80 (Est. 9.10)	—

¹ The figures in brackets before the average values show the number of individuals in the series measured by me. The anthropoids listed were measured by me in 1938—1939 and 1946—1947 in the United States at the Museum of Comparative Zoology of Harvard University, American Museum of Natural History in New York and the United States National Museum in Washington, D.C.

On this occasion I wish to extend my thanks to the Ministry of Education of the Republic of Turkey and to the University of Ankara for having sent me in 1946 to the United States to continue my researches on the dentition of Primates and to the Wenner-Gren Foundation for Anthropological Research of New York City for having extended to me an additional grant.

² Average of the right and left sides (16.80-17.00).

³ One chimpanzee of unknown sex is included.

TABLE 1 (Continued)

The Mesio-Distal Diameter of the Upper Permanent Canine

	Average	Range
<i>Plesianthropus transvaalensis</i> Broom. S2 (\odot ₊). Gregory and Hellman, 1939.	8.60	—
<i>Plesianthropus transvaalensis</i> Broom. Isolated tooth (\odot ₊). Broom, 1946.	10.00	—
<i>Paranthropus crassidens</i> . Atypical tooth. Broom and Robinson, 1952.	10.60	—
<i>Paranthropus crassidens</i> . Average calculated from range given by Broom and Robinson, 1952.	[6] 8.65	8.30-9.00
<i>Pithecanthropus modjokertensis</i> v. Koe- nigswald (<i>Pithecanthropus robustus</i> Weidenreich). Weidenreich, 1945.	9.50	—
<i>Sinanthropus pekinensis</i> Black. Average calculated from Weidenreich, 1937.	[6] 9.43	8.50-10.50
<i>Africanthropus njarasensis</i> Weinert. Remane, in Weinert, 1939.	9.00 (Prob. 9.10-9.20)	—
<i>Australian aborigines</i> . Campbell, 1925.	[116] 8.43	6.50-9.50
Pecos Indians. Nelson, 1938.	[86] 8.05	7.00-9.17
East Greenland Eskimos. Pedersen, 1949.	[16] 7.80	7.00-8.40
Bantu. Shaw, 1931.	[66] 7.60	7.00-8.50
Bushman tribe. Drennan, 1929.	[26] 7.50	7.00-8.30
Recent Whites. ⁴ Black, 1902.	7.60	—
<i>Homo sapiens</i> . ⁵ Şenyürek, 1940, 1941, 1946 and 1952.	[17] 7.89	6.70-8.70

⁴ In the tables listed the figures for recent whites are after Black (1902), cited by Campbell (1925), Drennan (1929), Shaw (1931) and Nelson (1938).

⁵ In the tables listed the group given as *Homo sapiens* is a mixed series consisting of whites, ancient Egyptians, American Indians, Negroes and Melanesians which I had measured at the Peabody Museum of Harvard University in 1938—1939.

TABLE 2¹
The Mesio - Distal Diameter of Upper Canine Relative to the
Mesio - Distal Diameters of P³ and P⁴

	C ¹ Length	P ³ Length	P ⁴ Length	Index I		Index II	
				C ¹ length x 100 P ³ length	P ⁴ length	C ¹ length x 100 P ⁴ length	P ³ length
<i>Pongo</i> (♂). Şenyürek.	(5) 17.51	(5) 10.16	(5) 9.50	172.86 [156.14-207.07]	184.39 [171.15-213.54]		
<i>Pongo</i> (♀). Şenyürek.	(8) 13.01	(8) 9.80	(8) 9.15	132.89 [117.64-142.39]	142.57 [133.33-160.91]		
<i>Gorilla</i> (♂). Şenyürek.	(12) 22.47	(12) 12.32	(12) 11.47	182.40 [163.33-198.24]	196.49 [166.10-228.57]		
<i>Gorilla</i> (♀). Şenyürek.	(1) 16.90	(1) 11.80	(1) 11.20	143.22	150.89		
<i>Pan</i> (♂). Şenyürek.	(3) 14.38	(3) 8.30	(3) 7.36	173.45 [167.81-179.37]	195.39 [189.61-199.99]		
<i>Pan</i> (♀). Şenyürek.	(8) 11.56	(8) 8.01	(8) 6.91	144.10 [124.36-165.66]	165.76 [136.61-188.80]		
<i>Pan</i> (♂ + ♀). Şenyürek.	(12) 12.40	(12) 8.66	(12) 7.05	153.72 [124.36-179.37]	174.63 [136.61-199.99]		
<i>Megathropus africanus</i> Weinert. Remane, 1951.	(max.) 11.00	9.60	9.10	114.58	120.87		
<i>Plesianthropus transvaalensis</i> Broom. S2. Broom, 1939 and 1946.	8.80	8.70	—	101.14	—		
<i>Plesianthropus transvaalensis</i> Broom. S2. Gregory and Hellman, 1939.	8.60	8.50	—	101.17	—		
<i>Plesianthropus transvaalensis</i> Broom. Broom and Robinson, 1950 and Robinson, 1953.	10.90 ²	9.50 ³	9.30 ³	114.71	117.20		

¹ In this table in the series measured by me, the figures in parentheses above the averages show the number of individuals measured and the figures in brackets below the averages denote the range. In the series measured by me in this table the indices were calculated from the skulls having C¹, P³ and P⁴ *in situ*. The indices of the material taken from the literature have been calculated by me.

² The isolated male canine measured by Broom and Robinson, 1950, p. 40.

³ The maximum mesio-distal diameters of P³ and P⁴ of *Plesianthropus transvaalensis* Broom, given by Robinson, 1953, p. 2.

TABLE 2 (Continued)
The Mesio - Distal Diameter of Upper Canine Relative to the
Mesio - Distal Diameters of P³ and P⁴

	C ¹ Length	P ³ Length	P ⁴ Length	Index I C ¹ length × 100 P ³ length	Index II C ¹ length × 100 P ⁴ length
<i>Pithecanthropus modjokertensis</i> v. Koenigswald (<i>Pithecanthropus robustus</i> Weidenreich), Weidenreich, 1945.	9.50	8.35 ⁴	8.35 ⁴	113.77	113.77
<i>Sinanthropus pekinensis</i> Black, Individual FIV (♂), Weidenreich, 1937.	10.50	9.20	—	114.13	—
<i>Sinanthropus pekinensis</i> Black, Individual LI (♀), Weidenreich, 1937.	8.50 (left)	8.70 (right)	—	97.70	—
<i>Sinanthropus pekinensis</i> Black, Averages calculated from Weidenreich, 1937.	(6) 9.43	(4) 8.32	(8) 7.93	113.34	118.91
<i>Africanthropus nyarasensis</i> Weinert, Remane, in Weinert, 1939.	9.00	7.90	—	113.00	—
Australian aborigines, Campbell, 1925.	(116) 8.43	(124) 7.81	(89) 7.20	107.93	117.08
Pecos Indians, Nelson, 1938.	(86) 8.05	(82) 7.43	(88) 7.01	108.33	114.83
East Greenland Eskimos, Pedersen, 1949.	(16) 7.80	(15) 7.50	(17) 6.80	104.00	114.70
Bantu, Shaw, 1931.	(66) 7.60	(62) 7.20	(87) 7.00	105.55	108.57
Bushman tribe, Drennan, 1929.	(26) 7.50	(27) 6.80	(28) 6.50	110.29	115.38
Recent Whites, Black, 1902.	7.60	7.20	6.80	105.55	111.76
<i>Homo sapiens</i> , Şenyürek.	(15) 7.92	(15) 6.95	(15) 6.72	114.99 [106.34-126.86]	118.22 [104.68-130.15]

⁴ Averages of right and left P³ and P⁴ of *Pithecanthropus modjokertensis* v. Koenigswald (*Pithecanthropus robustus*) given by Weidenreich, 1945, p. 28. According to Weidenreich (1945, p. 28) the mesio-distal diameter of both the right and left canine of *Pithecanthropus modjokertensis* is 9.5 mm.

TABLE 3¹
Length and Breadth Measurements of P₃

	Length (Mesio-distal diameter)	Breadth (Bucco-lingual diameter)	Robustness Value ²	Crown Index ³
<i>Pongo</i> (♂). Şenyürek.	[5] 10.16 (9.70-11.40)	[5] 12.68 (11.80-13.70)	129.13 (118.00-156.18)	124.97 (118.00-131.31)
<i>Pongo</i> (♀). Şenyürek.	[9] 9.80 (9.20-10.40)	[9] 11.69 (11.00-13.00)	114.65 (103.40-130.00)	119.47 (111.88-141.30)
<i>Gorilla</i> (♂). Şenyürek.	[13] 12.35 (10.30-13.00)	[13] 16.16 (14.20-18.60)	200.20 (161.71-241.80)	131.10 (121.42-152.42)
<i>Gorilla</i> (♀). Şenyürek.	[1] 11.80 ⁴	[1] 15.10 ⁴	178.20	127.98
<i>Pan</i> (♂). Şenyürek.	[4] 8.40 (8.00-8.70)	[4] 10.88 (9.50-12.00)	91.49 (76.00-104.40)	129.54 (118.75-140.24)
<i>Pan</i> (♀). Şenyürek.	[8] 8.01 (7.30-8.60)	[8] 9.31 (8.90-9.80)	74.68 (64.97-79.80)	116.43 (104.65-124.00)
<i>Pan</i> (♂ + ♀). ⁵ Şenyürek.	[15] 8.03 (7.00-8.60)	[15] 9.98 (8.90-11.10)	86.23 (64.97-85.47)	124.72 (104.65-151.42)
<i>Meganthropus africanus</i> Weinert. Remane, 1951.	9.60	12.30	118.08	128.12

¹ In this table, with the exception of the crown indices of all groups of recent man and robustness values of the East Greenland Eskimos, the robustness values and crown indices of the material taken from the literature have been calculated by me. In the series measured by me, the figures in brackets before the averages denote the number of individuals and the figures in parentheses below the averages show the range.

² Robustness value = length × breadth.

³ Crown index = $\frac{\text{Breadth} \times 100}{\text{Length}}$.

⁴ Average of two sides.

⁵ Three chimpanzees of unknown sex are included.

TABLE 3 (Continued)
Length and Breadth Measurements of P³

	Length (Meso-distal diameter)	Breadth (Bucco-lingual diameter)	Robustness Value	Crown Index
<i>Plesianthropus transvaalensis</i> Broom. Type. Broom, 1939.	9.20 (est. 8.90)	12.20 (est. 11.70)	112.24	132.60
<i>Plesianthropus transvaalensis</i> Broom. Type. Broom, 1946.	9.20	12.30	113.10	133.69
<i>Plesianthropus transvaalensis</i> Broom. Type. Gregory and Hellman, 1939.	9.50	12.60	119.70	132.63
<i>Plesianthropus transvaalensis</i> Broom. Type. Şenyürek, 1941.	9.10	12.20	111.02	134.06
<i>Plesianthropus transvaalensis</i> Broom. S2. Broom, 1939 and 1946.	8.70 (est. 9.00)	12.00	104.40	137.93
<i>Plesianthropus transvaalensis</i> Broom. S2. Gregory and Hellman, 1939.	8.50	11.60	98.60	136.47
Averages of 6 specimens of <i>Plesianthropus transvaalensis</i> Broom, calculated from the measurements given by Robinson, 1953.	[6] 9.05 (8.60-9.50)	[6] 12.71 (12.00-13.60)	115.21 (104.40-129.20)	140.56 (133.69-151.16)
<i>Australopithecus prometheus</i> Dart. Dart, 1949b.	8.50	11.70	99.45	137.64
<i>Paranthropus robustus</i> Broom. Type. Broom, 1946.	10.50	13.80	144.90	131.42
<i>Paranthropus robustus</i> Broom. Type. Broom and Robin- son, 1952.	10.30	13.80	142.14	133.98
<i>Paranthropus robustus</i> Broom. Type. Robinson, 1953.	10.30	13.80	142.14	133.98

TABLE 3 (Continued)
Length and Breadth Measurements of P₃

	Length (Mesio-distal diameter)	Breadth (Bucco-lingual diameter)	Robustness Value	Crown Index
<i>Paranthropus crassidens</i> , Robinson, 1953.	9.60	13.80	132.48	143.75
<i>Paranthropus crassidens</i> . Averages calculated from the ranges of measurements of 9 specimens given by Broom and Robinson, 1952.	[9] 9.90 (9.30-10.50)	[9] 14.35 (13.40-15.30)	142.06	144.94
<i>Pithecanthropus modjokertensis</i> v. Koenigswald (<i>Pithecanthropus robustus</i> Weidenreich). Weidenreich, 1945.	8.35 ⁶	12.40 ⁶	103.54	148.68
<i>Sinanthropus pekinesis</i> Black. Averages and indices calculated from Weidenreich, 1937.	[4] 8.32 (7.40-9.20)	[4] 11.87 (10.50-12.80)	99.59 (77.70-118.26)	142.71 (139.13-145.00)
<i>Africanthropus njarasensis</i> Weinert. Remane, in Weinert, 1939.	7.90 (est.8.10-8.20)	10.40	82.16	131.64
Australian aborigines. Campbell, 1925.	[124] 7.81 (7.00-9.00)	[163] 10.30 (8.50-12.00)	80.44	132.10
Pecos Indians. Nelson, 1938.	[82] 7.43 (6.54-8.42)	[82] 9.89 (8.78-11.00)	73.48	133.10 (118.30-157.90)
East Greenland Eskimos. Pedersen, 1949.	[15] 7.50 (6.60-8.60)	[20] 9.20 (6.80-10.50)	[15] 68.70 (49.00-81.20)	[15] 122.90 (104.70-136.10)
Bantu. Shaw, 1931.	[62] 7.20 (6.50-8.50)	[62] 9.00 (7.00-10.00)	64.80	132.40 (105.80-150.00)
Bushman tribe. Drennan, 1929.	[27] 6.80 (6.00-7.80)	[25] 8.60 (7.80-9.50)	58.48	126.90
Recent Whites. Black, 1902.	7.20	9.10	65.52	126.40
<i>Homo sapiens</i> . Şenyürek, 1940, 1941, 1946 and 1952.	[19] 6.96 (6.20-7.70)	[19] 9.39 (8.20-10.70)	65.31 (50.84-82.39)	134.91 (123.28-146.15)

⁶ Averages of two sides given by Weidenreich, 1945.

TABLE 4¹Height Measurements and Height Indices of P³

	Buccal Height	Ht. x 100 Length	Ht. x 100 Breadth
<i>Pongo</i> (♂). Şenyürek.	[4] 10.67 (10.00-11.30)	[4] 108.44 (101.01-115.46)	[4] 85.91 (76.92-91.05)
<i>Pongo</i> (♀). Şenyürek.	[6] 10.00 (8.60-11.10)	[6] 101.95 (87.75-113.26)	[6] 86.94 (74.13-100.00)
<i>Gorilla</i> (♂). Şenyürek.	[9] 12.70 (11.40-13.60)	[9] 101.48 (96.52-110.93)	[9] 78.36 (67.73-87.32)
<i>Gorilla</i> (♀). Şenyürek.	11.30 ²	95.80 ²	74.84 ²
<i>Pan</i> (♂). Şenyürek.	[4] 7.77 (7.00-8.30)	[4] 93.15 (87.50-101.21)	[4] 72.14 (65.00-78.30)
<i>Pan</i> (♀). Şenyürek.	[6] 7.00 (6.50-7.20)	[6] 86.57 (76.47-98.63)	[6] 76.00 (69.89-80.89)
<i>Pan</i> (♂ + ♀). Şenyürek.	[11] 7.40 (6.50-8.30)	[11] 90.53 (76.47-103.75)	[11] 75.17 (65.00-83.00)
<i>Meganthropus africanus</i> Weinert. Remane, 1951.	10.40	108.33	84.55
<i>Meganthropus africanus</i> Weinert. Height after Şenyürek; length and breadth after Remane, 1951.	10.50	109.37	85.36
<i>Pithecanthropus modjokertensis</i> v. Koenigswald (<i>Pithecanthropus robustus</i> Weidenreich). Weidenreich, 1945.	8.55+ ³	102.39+	68.95+
<i>Sinanthropus pekinensis</i> Black. Individual F IV. Weidenreich, 1937.	[1] 9.70	[1] 105.43	[1] 75.78
Pecos Indians. Nelson, 1938.	[82] 7.95	106.99	80.38
Bantu. Shaw, 1931.	[62] 7.90 (7.00-8.50)	109.72	87.77
Bushman tribe. Drennan, 1929.	[17] 6.60	97.05	76.74
<i>Homo sapiens</i> . Şenyürek, 1940, 1946 and 1952.	[18] 8.06 (6.70-9.00)	[18] 115.61 (100.00-130.64)	[18] 85.60 (75.70-98.78)

¹ The indices of the material taken from the literature have been calculated by me. In the series measured by me the figures in brackets before the averages denote the number of individuals and the figures in parentheses below the averages show the range

² Averages of two sides.

³ Averages of two sides given by Weidenreich, 1945.

TABLE 5¹
Length and Breadth Measurements of P⁴

	Length (Mesio-distal diameter)	Breadth (Bucco-lingual diameter)	Robustness Value	Crown Index
<i>Pongo</i> (♂). Şenyürek.	[5] 9.50 (9.00-10.40)	[5] 13.00 (12.30-13.80)	123.72 (110.70-143.52)	136.98 (132.69-144.44)
<i>Pongo</i> (♀). Şenyürek.	[9] 9.07 (8.50-9.60)	[9] 12.07 (11.60-12.90)	109.72 (99.45-117.12)	133.21 (126.08-141.17)
<i>Gorilla</i> (♂). Şenyürek.	[12] 11.36 (10.10-12.70)	[12] 15.75 (14.60-17.80)	178.91 (151.98-210.04)	139.42 (125.98-150.84)
<i>Gorilla</i> (♀). Şenyürek.	11.20 ²	14.15 ²	158.48	126.33
<i>Pan</i> (♂). Şenyürek.	[4] 7.37 (7.10-7.70)	[14] 10.61 (10.00-11.30)	78.31 (73.00-87.01)	143.93 (136.98-153.52)
<i>Pan</i> (♀). Şenyürek.	[8] 6.91 (6.10-7.60)	[8] 9.47 (8.80-10.20)	65.57 (55.44-74.48)	138.01 (122.66-167.31)
<i>Pan</i> (♂ + ♀). Şenyürek.	[15] 7.06 (6.10-7.70)	[15] 9.91 (8.80-11.30)	70.16 (55.44-87.01)	140.92 (122.66-167.31)
<i>Meganthropus africanus</i> Weinert. Remane, 1951.	9.10	12.50	113.75	137.36
<i>Plesianthropus transvaalensis</i> Broom. Type. Broom, 1939.	9.00	12.80	115.20	142.22
<i>Plesianthropus transvaalensis</i> Broom. Type. Broom, 1946.	9.30	12.80	119.04	137.63
<i>Plesianthropus transvaalensis</i> Broom. Type. Gregory and Hellman, 1939.	8.70	12.50	108.75	143.67
<i>Plesianthropus transvaalensis</i> Broom. Type. Şenyürek, 1941.	8.80	12.70	111.76	144.31
Averages of 3 specimens of <i>Plesianthropus transvaalensis</i> Broom, calculated from the measurements given by Robinson, 1953.	9.03 (8.50-9.30)	12.76 (12.20-13.30)	115.18 (113.05-119.04)	141.76 (131.18-156.47)
<i>Australopithecus prometheus</i> Dart, 1949b.	9.40	12.60	118.44	134.04

¹ In this table with the exception of the crown indices of all groups of recent man and robustness values of East Greenland Eskimos, the robustness values and crown indices of the material taken from the literature have been calculated by me. In the series measured by me, the figures in brackets before the averages denote the number of individuals and the figures in parentheses below the averages show the range.

² Averages of two sides.

TABLE 5 (Continued)
Length and Breadth Measurements of P⁴

	Length (Meso-distal diameter)	Breadth (Bucco-lingual diameter)	Robustness Value	Crown Index
<i>Paranthropus robustus</i> Broom. Type. Broom, 1939.	10.20	15.30	156.06	150.00
<i>Paranthropus robustus</i> Broom. Type. Broom, 1946.	10.5 (max.)	15.30	160.65	145.52
<i>Paranthropus robustus</i> Broom. Type. Gregory and Hellman, 1939.	9.60	15.20	145.92	158.33
<i>Paranthropus robustus</i> Broom. Type. Şenyürek, 1941.	9.90	14.50?	143.55	146.46
<i>Paranthropus robustus</i> Broom. Robinson, 1952.	10.00	15.20	152.00	152.00
<i>Paranthropus crassidens</i> . Robinson, 1953.	10.50	15.80	165.90	150.47
<i>Paranthropus crassidens</i> . Averages calculated from the ranges of measurements of 10 specimens given by Broom and Robinson, 1952.	10.35 (9.20-11.50)	15.55 (14.70-16.40)	160.94	150.24
<i>Pithecanthropus modjokertensis</i> v. Koenigswald <i>ecanthropus robustus</i> Weidenreich). Weidenreich, 1945. <i>Sinanthropus pekinensis</i> Black. Averages and indices calculated from Weidenreich, 1937.	8.35 ³ [9] 7.93 (7.20-8.90)	12.20 ³ [9] 11.35 (10.30-12.10)	101.87	146.10
Australian aborigines. Campbell, 1925.	[89] 7.20 (6.50-8.25)	[168] 10.14 (8.50-12.00)	73.00	140.30
Pecos Indians. Nelson, 1938.	[88] 7.01 (6.32-7.96)	[88] 9.18 (8.12-9.95)	64.35	130.40 (114.00-147.80)
East Greenland Eskimos. Pedersen, 1949.	[17] 6.80 (5.60-7.40)	[21] 9.20 (7.70-10.00)	[17] 61.50 (43.10-74.00)	[17] 130.80 (104.30-147.70)
Bantu. Shaw, 1931.	[87] 7.00 (6.50-8.00)	[87] 9.10 (8.00-10.50)	63.70	135.80 (120.00-146.00)
Bushman tribe. Drennan, 1929.	[28] 6.50 (5.80-7.30)	[26] 8.50 (7.30-9.30)	55.26	131.10
Recent Whites. Black, 1902.	6.80	8.80	59.84	129.40
<i>Homo sapiens</i> . Şenyürek, 1941, 1946 and 1952.	[19] 6.73 (5.80-7.90)	[19] 9.37 (8.40-10.40)	63.27 (48.72-81.37)	139.43 (128.35-151.51)

³ Averages of two sides given by Weidenreich, 1945.

TABLE 6¹
Height Measurements and Height Indices of P⁴

	Buccal Height	Ht. × 100	Ht. × 100
		Length	Breadth
<i>Pongo</i> (♂). Şenyürek.	[2] 9.20 (9.00-9.40)	102.22 (100.00-104.44)	72.82 (69.23-76.42)
<i>Pongo</i> (♀). Şenyürek.	[7] 9.47 (8.50-10.50)	103.70 (93.75-114.35)	78.48 (71.37-85.24)
<i>Gorilla</i> (♂). Şenyürek.	[9] 11.66 (11.00-12.80)	100.99 (91.66-107.61)	73.59 (61.80-77.57)
<i>Gorilla</i> (♀). Şenyürek.	[1] 10.45 ²	93.30 ²	74.10 ²
<i>Pan</i> (♂). Şenyürek.	[4] 6.57 (6.30-6.80)	89.21 (85.13-94.36)	62.03 (59.29-65.00)
<i>Pan</i> (♀). Şenyürek.	[5] 6.31 (5.60-6.80)	90.28 (81.33-106.40)	67.43 (60.86-73.86)
<i>Pan</i> (♂ + ♀). Şenyürek.	[10] 6.52 (5.60-7.40)	91.10 (81.33-106.40)	66.08 (59.29-75.51)
<i>Meganthropus africanus</i> Weinert. Remane, 1951.	8.40	92.30	67.20
<i>Pithecanthropus modjokertensis</i> v. Koenigswald (<i>Pithecanthropus robustus</i> Weidenreich). Weidenreich, 1945.	8.00+ ³	95.80+ ³	65.57+ ³
<i>Sinanthropus pekinensis</i> Black. Weidenreich, 1937.	[2] 8.25 ⁴ (8.20-8.30)	96.59 (93.18-100.00)	69.33 (68.59-70.08)
Pecos Indians. Nelson, 1938.	[88] 7.60 (6.76-8.65)	108.41	82.78
Bantu. Shaw, 1931.	[87] 7.70 (6.50-9.00)	110.00	84.61
Bushman tribe. Drennan, 1929.	[15] 6.30	96.92	74.11
<i>Homo sapiens</i> . Şenyürek, 1946 and 1952.	[17] 7.47 (6.00-8.50)	111.22 (94.02-130.76)	79.33 (71.42-89.47)

¹ Indices of the material taken from the literature have been calculated by me. In the series measured by me figures in brackets before the averages denote the number of individuals and those in parentheses below the averages show the range.

² Averages of two sides.

³ Averages of two sides, given by Weidenreich, 1945. The height given for right P⁴ by Weidenreich (1945) is 7.5 mm., giving a height-length index of 91.46 and a height-breadth index of 61.98. On the left side height is 8.5 mm., height-length index is 100.00 and the height-breadth index 69.10.

⁴ *Sinanthropus* specimens 27 (♀) and 133' (♀).

TABLE 7¹
Measurements of P³ Relative to those of P⁴

	Length of P ³ X100	Height of P ³ X100	Robustness value of P ³ X100
	Length of P ⁴	Height of P ⁴	Robustness value of P ⁴
<i>Pongo</i> (♂). Şenyürek.	[5] 106.96 (102.10-111.11)	[2] 116.77 (113.33-120.21)	[5] 104.34 (96.59-111.54)
<i>Pongo</i> (♀). Şenyürek.	[9] 108.26 (96.84-115.29)	[6] 107.39 (101.06-117.44)	[9] 104.76 (96.87-110.32)
<i>Gorilla</i> (♂). Şenyürek.	[13] 109.04 (98.34-125.74)	[9] 108.91 (101.78-114.54)	[13] 112.12 (99.60-129.34)
<i>Gorilla</i> (♀). Şenyürek.	105.35 ²	108.13 ²	112.44 ²
<i>Pan</i> (♂). Şenyürek.	[4] 113.89 (109.56-115.49)	[4] 119.06 (107.69-129.13)	[4] 116.56 (104.10-121.85)
<i>Pan</i> (♀). Şenyürek.	[8] 117.23 (109.85-136.00)	[5] 109.48 (100.00-128.57)	[8] 114.65 (105.35-137.54)
<i>Pan</i> (♂ + ♀). Şenyürek.	[15] 114.39 (104.47-136.00)	[10] 113.58 (100.00-129.13)	[15] 114.90 (104.10-137.54)
<i>Meganthropus africanus</i> Weinert. Remane, 1951.	105.49	123.80 ³	103.80
<i>Plesianthropus transvaalensis</i> Broom. Type. Broom, 1939.	102.22	—	97.43
<i>Plesianthropus transvaalensis</i> Broom. Type. Broom, 1946.	98.92	—	95.06
<i>Plesianthropus transvaalensis</i> Broom. Type. Gregory and Hellman, 1939.	109.19	—	110.06
<i>Plesianthropus transvaalensis</i> Broom. Type. Şenyürek, 1941.	103.40	—	99.33
<i>Plesianthropus transvaalensis</i> Broom. 3 specimens having both P ³ and P ⁴ . Robinson, 1953.	[3] 98.59 (95.69-101.17)	—	[3] 96.28 (94.91-98.89)
<i>Australopithecus prometheus</i> Dart. Dart, 1949 [b].	90.42	—	83.96
<i>Paranthropus robustus</i> Broom. Type. Broom, 1946.	100.00	—	90.19
<i>Paranthropus robustus</i> Broom. Type. Robinson, 1953.	103.00	—	93.51
<i>Paranthropus crassidens</i> . Robinson, 1953.	91.42	—	79.85
<i>Pithecanthropus modjokertensis</i> v. Koenigswald (<i>Pithecanthropus robustus</i> Weidenreich). Weidenreich, 1945.	100.00 ⁴	106.87 ⁴	101.63 ⁴

TABLE 7 (Continued)
Measurements of P³ Relative to those of P⁴

	Length of P ³ X100	Height of P ³ X100	Robustness value of P ³ X100
	Length of P ⁴	Height of P ⁴	Robustness value of P ⁴
<i>Sinanthropus pekinensis</i> Black. 3 specimens (individuals LI, LII and OI) containing both P ³ and P ⁴ . Weidenreich, 1937.	[3] 102.89 (97.75-109.58)	—	[3] 103.86 (98.53-114.52)
<i>Sinanthropus pekinensis</i> Black. Calculated from the averages given in Tables 3, 4, 5 and 6.	104.91	117.57	110.14
Australian aborigines. Campbell, 1925.	108.47	—	110.19
Pecos Indians. Nelson, 1938.	105.99	104.60	114.18
East Greenland Eskimos. Pedersen, 1949.	110.29	—	111.70
Bantu. Shaw, 1931.	102.85	102.59	101.72
Bushman tribe. Drennan, 1929.	104.61	104.76	105.82
Recent Whites. Black, 1902.	105.88	—	109.49
<i>Homo sapiens</i> . Şenyürek.	[19] 103.71 (96.87-112.12)	[17] 108.70 (98.52-117.91)	[19] 103.22 (86.34-117.10)

¹ The indices of the material taken from the literature have been calculated by me.

In the series measured by me the figures in brackets before the averages show the number of individuals and those below the averages, in parentheses, denote the range. In the series measured by me only individuals having both P³ and P⁴ are utilized.

² Averages of two sides.

³ P³ height of *Meganthropus africanus* Weinert is the middle height given by Remane, 1951.

⁴ Calculated from the averages of two sides given by Weidenreich, 1945.

TABLE 8
Measurements of the Third Upper Molar¹

	Maximum Length (Mesio-distal diameter)	Maximum Breadth (Bucco-lingual diameter)	Robustness Value	Crown Index
<i>Pongo</i> (♂). Şenyürek.	[3] 12.10 (11.80-12.30)	[3] 13.60 (12.90-14.60)	164.97 (158.12-178.12)	112.69 (104.87-119.67)
<i>Pongo</i> (♀). Şenyürek.	[5] 10.76 (9.60-11.50)	[5] 12.79 (12.00-13.60)	137.66 (124.80-156.40)	119.41 (109.56-135.41)
<i>Gorilla</i> (♂). Şenyürek.	[12] 15.42 (14.00-17.50)	[12] 16.28 (15.40-17.80)	251.52 (220.22-306.16)	105.69 (98.25-111.76)
<i>Pan</i> (♂). Şenyürek.	[3] 9.56 (9.20-10.00)	[3] 11.50 (10.80-12.10)	110.18 (99.36-121.00)	120.16 (117.39-122.10)
<i>Pan</i> (♀). Şenyürek.	[7] 8.97 (7.70-10.00)	[7] 10.35 (9.00-11.30)	93.46 (69.30-103.40)	115.53 (109.47-120.00)
<i>Pan</i> (♂ + ♀). Şenyürek.	[12] 9.16 (7.70-10.00)	[12] 10.70 (9.00-12.10)	98.53 (69.30-121.00)	116.94 (108.51-125.55)
The tooth attributed to <i>Meganthropus africanus</i> Wejnert, by Wejnert and Remane. Remane, 1951.	10.90	13.00	141.70	119.26
<i>Plesianthropus transvaalensis</i> Broom. Type. Broom, 1939.	13.80	15.30	211.14	110.86
<i>Plesianthropus transvaalensis</i> Broom. Type. Gregory and Hellman, 1939.	13.20	15.20	200.64	115.15
<i>Plesianthropus transvaalensis</i> Broom. Type. Şenyürek, 1941.	13.20	14.90	196.68	112.87
<i>Plesianthropus transvaalensis</i> Broom. Second individual. Broom, 1939.	13.40	15.10	202.34	112.68
<i>Plesianthropus transvaalensis</i> Broom. Second individual. Broom, 1946.	13.60 (est. 14.30)	15.20	206.72	111.76
<i>Plesianthropus transvaalensis</i> Broom (Referred to <i>Plesianthropus</i> by Broom, 1946). Shaw, 1940.	13.00	14.70	191.10	113.07
<i>Plesianthropus transvaalensis</i> Broom (Shaw's tooth, referred to <i>Plesianthropus</i> by Broom, 1946). Broom, 1946.	13.10 (est. 13.50)	14.70	192.57	112.21
<i>Plesianthropus transvaalensis</i> Broom (Shaw's tooth, referred to <i>Plesianthropus</i> by Broom, 1946). Şenyürek [from cast].	13.10	14.40	188.64	109.92
<i>Plesianthropus transvaalensis</i> Broom. S3. Old male, worn. Broom, 1939.	(12.20)	(14.90)	(181.78)	(122.13)
<i>Plesianthropus transvaalensis</i> Broom. S3. Old male, worn. Broom, 1946.	(12.10) (est. 12.70)	(14.90)	(180.29)	(123.14)
<i>Paranthropus robustus</i> Broom. Type. Broom, 1939.	14.30	16.00	228.80	111.88
<i>Paranthropus robustus</i> Broom. Type. Broom, 1946.	14.20	16.00	227.20	112.67
<i>Paranthropus robustus</i> Broom. Type. Gregory and Hellman, 1939.	13.50	16.00	216.00	118.51
<i>Paranthropus robustus</i> Broom. Type (Right). Şenyürek (From cast).	13.60	15.50	210.80	113.97
<i>Paranthropus robustus</i> Broom. Left. Broom, 1946.	14.60	15.40	224.84	105.47
<i>Paranthropus robustus</i> Broom. Broom and Robinson, 1952.	13.70 14.10	15.80 16.20	216.46 228.42	115.32 114.89
<i>Paranthropus crassidens</i> . Averages of 18 specimens. Broom and Robinson, 1952.	[18] 14.60 (13.50-16.20)	[18] 16.90 (16.00-18.30)	246.74	115.75
<i>Sinanthropus pekinensis</i> Black. ² Averages calculated from Weidenreich, 1937.	[8] 9.65 (8.70-10.40)	[8] 11.71 (10.90-12.50)	113.36 (90.48-126.25)	121.34 (116.34-127.55)
Australian aborigines. Campbell, 1925.	[142] 10.03 (8.00-13.00)	[193] 12.33 (10.00-15.00)	123.66	113.00
Pecos Indians. Nelson, 1938.	[84] 9.36 (7.89-10.70)	[84] 10.57 (9.24-12.49)	98.93	113.10 (101.20-143.40)
East Greenland Eskimos. Pedersen, 1949.	[35] 9.60 (8.00-11.10)	[35] 11.10 (8.30-13.00)	107.30 (73.90-139.10)	117.20 (93.30-131.30)
Bantu. Shaw, 1931.	[80] 9.50 (8.00-10.50)	[80] 11.00 (8.50-12.50)	104.50	119.60 (94.40-135.20)
Bushman tribe. Drennan, 1929.	[26] 8.20 (7.00-9.80)	[26] 10.30 (9.30-12.00)	84.46	125.70
Recent Whites. Black, 1902.	8.60	10.60	91.16	123.30
<i>Homo sapiens</i> . Şenyürek, 1941, 1946 and 1952.	[12] 8.63 (7.50-9.70)	[12] 10.96 (9.30-12.00)	95.12 (76.80-113.49)	127.08 (117.39-142.85)

¹ With the exception of the crown indices of all groups of recent man and robustness values of the East Greenland Eskimos, the robustness values and crown indices of the material taken from the literature have been calculated by me.

² Haberer's tooth has not been included in these averages.

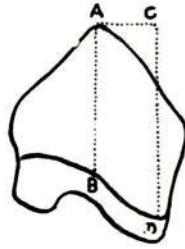


Fig. 1



Fig. 2

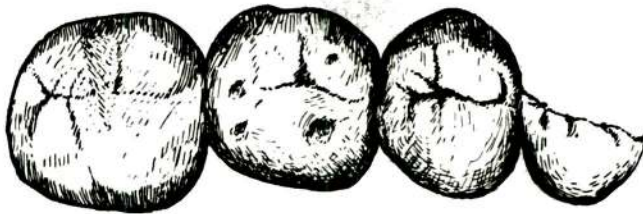


Fig. 3

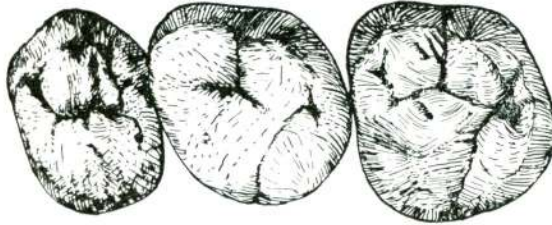


Fig. 4



Fig. 5



Fig. 6