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ORDER OF ERUPTION OF THE PERMANENT TEETH IN THE CHALCOLITHIC AND COPPER AGE INHABITANTS OF ANATOLIA

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During the course of earlier studies on the crania and teeth of the Chalcolithic and Copper Age inhabitants of Anatolia, I had come across some specimens with permanent teeth in the process of eruption. In view of this I decided to study the order of eruption of the permanent teeth in the available material.[1]

Most of the material studied is preserved in the Division of Palaeoanthropology of the University of Ankara, a few in the Alaca Höyük Museum in Çorum,[2] and some, those from Troy, in the Museum of Antiquities in İstanbul.[3]

[1] This study is the second in a series of papers on "The dentition of the Chalcolithic and Copper Age inhabitants of Anatolia". For the first paper see Şenyürek, 1952A.

[2] For these see Şenyürek, 1951B.

[3] During a short visit to İstanbul in the early summer of 1955, I had occasion to see three of the Troy skulls preserved in the Musuem of Antiquities. These are no. 1 Tr. of Troy I Period and nos. 2 Tr. and 5 Tr. of Troy II period. In this connection I wish to express my thanks to Mr. Nezih Fıratlı, Miss Servet Bucak, Mrs. Zekiye Başak and Mr. Lutfi Tuğrul of this museum for locating these three skulls for me.

Schultz defines an erupting tooth as follows: "*In the skulls of primates a tooth is considered to be erupting when the uppermost portion of its crown reaches clearly above and not merely to the alveolar margin. In many juvenile skulls one or more permanent Premolars can be seen underneath the corresponding deciduous molars which are evidently almost ready to drop out. Even though a Premolar actually projects above the alveolar margin, it is not counted as an erupting tooth until the deciduous molar to be replaced has definitely lost its hold by even the last of its roots.*"[4] This definition has also been followed in the present study. [5] In order to compare the state of eruption of various teeth, teeth that were still in the process of eruption were, following Schultz, clasisfied as 1/4th, 2/4ths and 3/4ths erupted. [6]

ORDER OF ERUPTION IN CHALCOLITHIC AND COPPER AGE SKULLS [7]

The skulls from Yümüktepe:

Among the Chalcolithic Age crania from Yümüktepe, described by me, [8] there is only one individual with upper and lower jaws in which the eruption of the permanent teeth is not yet complete. In the mandible of this individual (No. H. 2) from level XIX, which corresponds to Garstang's middle Chalcolithic Age, [9] all the permanent teeth, with the exception of the third molars, are fully erupted. The right lower third molar is still unerupted and in its alveolus, while the left lower third molar is 1/4th erupted. Of the upper teeth

[4] Schultz, 1935, p. 494.

[5] A similar classification has also been used by Clements and Zuckerman, who state (Clements and Zuckerman, 1953, p. 314): "*In both sets of records teeth were classified as non-erupted, when their crowns were below the level of the alveolar margin; as erupting, when the entire top of the crown was above the alveolar margin or, in the case of living and embalmed animals, had just pierced the gum; or as erupted, when the tooth was fully or almost completely in place.*"

[6] See Schultz, 1935, p. 509.

[7] The Chalcolithic and the succeeding Copper Ages in Anatolia range from about the beginning of the 4th millenium B. C. to approximately the end of the third millenium B. C. For the dating of Chalcolithic and Copper Ages in Anatolia see Özgüç, 1945; Krogman (after L. Braidwood), 1949, table 1; Garstang, 1953, pp. 2 and 69.

[8] Şenyürek, 1954.

[9] See Garstang, 1953, p. 2.

only the left permanent molars are preserved in a small fragment of maxilla. [10] The left upper third molar has just begun to erupt, that is, it is more retarded in this respect than the left lower third molar. The lower canines, especially the left one, are more worn than the lower premolars and the lower second molars. This suggests that in this individual the lower canines had preceded the lower premolars and second molars in eruption.

The skulls from Tabara (Tabara El Akrad) :

In two of the three skeletons from this site in the Hatay, the eruption of the permanent teeth is not yet complete. [11] The first of these, the earliest one, is from level VII, which according to Hood, dates from "*a late phase of that variety of the 'Northern 'Ubaid' Chalcolithic Culture which flourished in the Amuq plain, and which is illustrated by the upper levels at Tell Esh Sheikh.*" [12] The second one is from level VI, the pottery of which, according to Hood, "*shows affinities with Mesopotamian 'Uruk' and 'Jemdet Nasr' wares on the one hand, and with the Early Bronze Age pottery of Palestine on the other.*" [13]

In the individual from level VII, who represents an adolescent boy of about 15 years of age, all the permanent lower teeth, with the exception of the third molars are erupted (fig. 2). In the upper jaw, aside from the permanent canines and third molars, all the other permanent teeth are in place (fig. 1). The right upper third molar is still unerupted, but its occlusal surface is clearly visible just below the alveolar margin, that is, it was getting ready to erupt. [14] On the other hand, the right and left lower third molars are not at all visible. Thus it would seem that in this individual, at least, the right upper third molar would appear before the lower third molars. In the unerupted left upper canine, which lies in an oblique position, the root is completely formed and hooked. In the right

[10] For the pictures of upper and lower teeth see Şenyürek, 1954, figs. 5-6.

[11] The skeletons from Tabara will be described in a coming paper. In this connection I wish to thank Mr. Sinclair Hood and Mr. Baki Öğün for entrusting the description of this material to me.

[12] Hood, 1951, p. 115.

[13] Ibid., p. 115.

[14] The left side of the upper jaw behind the canine is broken and the left premolars and molars are missing (see fig. 1).

permanent canine, the unerupted crown of which stands almost vertically medial to the retained alveolus of the deciduous canine, also, as far as can be seen, the root, at least its greatest portion, is developed, extending upward and slightly backward in the bone. It is thus seen that both of the these permanent canines were impacted and would never erupt. In the mandible the right first premolar is fresher than the right canine which is but slightly worn, suggesting that the lower canine appeared at least before the first premolar.

In the mandible of the individual from level VI, all the permanent teeth with the exception of the third molars are in place (fig. 3).[15] In this mandible of late Chalcolithic Age the right permanent canine is more worn than the second molar, suggesting that the former had preceded the latter in eruption.

The skulls from Fikirtepe (İstanbul):

Among the skeletons from Fikirtepe, which is a Chalcolithic site on the Asiatic side of the Bosporus, the eruption of the permanent teeth is still incomplete in only one (No. B), which belong to a boy of about 11-12 years of age.[16] In the mandible of this individual, excavated in 1954, only the first permanent molars and the permanent central and lateral incisors have completed their eruption (fig. 6).[17] The milk canines and the two milk molars were still in use.[18] The second lower permanent molars, on both the right and and left sides, are only 1/4th erupted. Thus it is clear that in the mandible of this child, in which the wisdom teeth were still far from erupting, the permanent canines and the premolars would erupt later than the second permanent molars.

[15] The upper jaw of this individual has not been preserved.

[16] The skeletons from Fikirtepe will be described in a future paper. On this occasion I wish to express my thanks to Prof. Dr. Arif Müfid Mansel, director of Fikirtepe excavation, Prof. Dr. Kurt Bittel and Docent Dr. Halet Çambel, all of the University of İstanbul, for entrusting the description of this Chalcolithic material to me.

[17] Only the right central incisor is preserved, the other lower permanent incisors being represented by their alveoli.

[18] The left lower deciduous canine is preserved, while the right deciduous canine has been lost after death, only its alveolus being retained.

In the upper jaw of this individual the first permanent molars and the permanent central and lateral incisors have again completed their eruption (figs. 4-5). On both sides of the upper jaw the deciduous canines are still functioning[19] and the second permanent molars are 1/4th erupted. But there is a difference in the eruption of the premolars between the right and left sides of this upper jaw. On the right side, both the first and second deciduous molars are retained. In contrast to these, on the left side, the two milk teeth have been shed. On this side the first premolar is fully erupted, while the second premolar is about 1/4th erupted. The second upper left premolar is found in a large depression due to the absorption of the bone which suggests that the second milk molar of this side was probably diseased. On the other hand, the alveolus of the left first upper premolar is normal. It is clear that on the right side of this upper jaw, in which the wisdom teeth were still far from erupting, the premolars would erupt later than the second permanent molars. On the other hand, on the left side of this maxilla the first premolar has preceded the second molar in eruption, while the left second premolar erupts at about the same time as the latter. It is also evident that the permanent upper canines erupt later than the premolars and second permanent molars.[20]

The skulls from Kumtepe:

Among the Chalcolithic skeletons from Kumtepe, studied by Kansu[21] and me,[22] in one (No. 2), at least one of the third molars has not erupted. In this male individual of 21-22 years of age, all the upper permanent teeth, at least on the left side, have fully erupted. In the lower jaw all the permanent teeth in front of the third molars have also erupted. The region of the right lower wisdom tooth is damaged and this tooth together with the right M_2 is missing, while the left lower third molar is congenitally missing.

[19] The left upper deciduous canine is preserved while the right deciduous canine has been lost after death, only its alveolus having been preserved.

[20] The crown of the left upper permanent canine is visible through a crack in the bone above the root of the left milk canine (fig. 5).

[21] Kansu, 1937.

[22] Şenyürek, 1949.

The skulls from Troy:

The skulls found in the first and second settlements of Troy by the University of Cincinnati Expedition belong to individuals in which the eruption of the permanent teeth is not complete. Of the four skulls found by the University of Cincinnati Expedition, one (No. 1 Tr.) belongs to Troy I which is of Chalcolithic Age and the other three (Nos. 2 Tr., 3 Tr. and 5 Tr.) to Troy II which belongs to the Copper Age. [23] These skulls have already been described by Angel. [24] I have restudied Nos. 1 Tr., 2 Tr. and 5 Tr. from this site[25] during the short visit I made to İstanbul early in the summer of 1955.

Skull No. 1 Tr. has been described by Angel as a "Child *of about eleven, perhaps* male..." [26] But Angel has unfortunately made no reference to the interesting mode of eruption exhibited by the permanent teeth of this child. In this individual the left maxilla is preserved together with the teeth *in situ* (figs. 7-8), while the preserved teeth of the right side are found isolated.[27] In the upper jaw of this child the first permanent molars and central and lateral permanent incisors have fully erupted. The left first premolar is erupted (figs. 7-8). [28] The right upper first premolar is isolated, but is of about the same development as the left tooth, indicating that it too was erupted. The left second permanent molar is about 1/2 erupted. [29] The left milk canine is in place, while the right milk canine is missing. [30] The left second milk molar is *in situ*, while the

[23] For the correlation of Troy settlements with those of other Anatolian sites see Özgüç, 1945, table and Garstang, 1953, p. 2.

[24] Angel, 1951.

[25] During this short visit, unfortunately I could not locate (as the material is packed in cases) and study No. 3 Tr.

[26] Angel, 1951, p. 5. For a brief reference to the order of eruption of the permanent teeth of this child see Şenyürek, 1955, p. 420.

[27] In the photograph shown in figs. 7-8, the right I^1 and I^2 have been glued to the maxilla. This piece of maxilla, which according to the photographs published by Angel (1951, pl. I) had been glued to the skull, is now found isolated, having become disjoined probably during the packing.

[28] See also Angel. 1951, pl. I.

[29] The right upper second molar is missing.

[30] The left upper milk canine was found isolated and I have placed it in its alveolus. In this left milk canine the root is partially divided (see fig. 8). On the

right second milk molar is found isolated. Only a germ of the left upper third molar is preserved. In this tooth only a small part of the crown is formed, showing that it was still far from erupting. From the account given it is clear that in the upper jaw of this child the first premolar erupts before the second permanent molar, while the permanent canine and the second premolar would erupt later than the second molar.

In the mandible of this individual, the first permanent molars and permanent central and lateral incisors are fully erupted. The eruption of the second permanent molar, on both sides, is also nearing completion (fig. 9).[31] Both the right and left milk canines are still *in situ* and functioning. The left first milk molar is also in place, while the right one is found isolated. It is thus evident that the right first milk molar also was still functioning at the time of death. The left second milk molar is also in place, while the right second milk molar has been lost after death. The right second premolar is still within its socket. The right and left third molars are still buried in their alveoli. From the account given it is clear that in the mandible of this child the permanent canines and the first and second premolars erupted after the second permanent molars. It is also seen that the second lower permanent molar is more advanced in eruption than the upper second molar.

It is evident that this individual from Troy I has retained some primitive traits in the order of eruption of its permanent teeth.

Individual No. 2 Tr. from Troy II is described by Angel as a: "Child *of 12-13 years, perhaps* male." [32] In this individual (figs. 10-11), with the exception of the upper and lower wisdom teeth, all the permanent teeth have erupted. The right upper second molar is *in situ*, while the region of the left upper second molar is broken and this tooth has been glued, presumably by Angel, to the back of the first molar. In this skull the roots of the upper second molar are 1/2 formed, while that of the upper second premolar is 2/3 rds and that of the first premolar is 3/4ths developed. The development of the

buccal side a deep groove divides the root clearly into a mesial and a distal branch, while on the lingual side the root is undivided.

[31] See also Angel, 1951, pl. I.

[32] Ibid., p. 6.

root of the upper permanent canine is about the same as that of the first upper premolar. In the lower jaw the roots of the second molar are again about 1/2 formed. In the lower first premolar 2/3rds and in the second premolar about 3/4ths of the root is developed. The root of the lower permanent canine shows about the same development as that of the lower second premolar. The conditions of the roots indicate that the permanent canines and the first and second premolars, in both the upper and lower jaws, erupt before the second permanent molars. Thus the mode of eruption in this individual from Troy II appears to be near that of the majority of recent whites.

The young individual No. 5 Tr. from Troy II is described by Angel as: "Child *of ca. 8 years, possible* female." [33] In this individual unfortunately only the anterior (premaxillary) portion of the maxilla is preserved together with right and left central permanent incisors, the left second permanent incisor and the alveolus of right second permanent incisor. Thus nothing can be said about the state of eruption of the other teeth.

The skull No. 3 Tr. from Troy II is described by Angel as a "Young adult female." [34] Further on Angel states: "...*the broad teeth rows lack third molars (suppressed) and are short relative to length of the jaw and maxilla.*"[35] The photographs published by Angel [36] show that the upper and lower wisdom teeth are lacking. [37]

The skulls from Alaca Höyük:

In individual No. 15 of Chalcolithic Age, all the teeth that are functioning are of the deciduous set. In this individual the upper and lower first permanent molars are unerupted but near the alveolar margin, that is, they are getting ready to erupt. On the other hand, the upper and lower central incisors are still deeply embedded within their respective alveoli. This suggests that in this child

[33] Ibid., p. 7.
[34] Ibid., p. 6.
[35] Ibid., p. 7.
[36] Ibid., pl. IV.
[37] In this connection it may also be recorded that, as far as can be judged from the drawings published by Virchow (1882, pls. I-III), in the skull No. A 1 from Troy II and in skulls No. A2 and A3 from Troy III the wisdom teeth were not erupted.

upper and lower first permanent molars would erupt before the upper and lower central permanent incisors. In individual No. Al.H.M II of Chalcolithic Age, representing a male of about 25 years of age, as noted in an earlier study, with the exception of the wisdom teeth, all the permanent teeth have completed their eruption. [38] In my previous study I described the state of eruption of the third molars of this individual as follows: "*Though the left third upper molar has erupted, it is still not at the level of the second upper molar. The right third upper molar is missing and this part of the alveolar process is broken. But a contact facet on the distal face of the crown of right second upper molar shows that the right third molar had also erupted. In this lower jaw, the right third molar has not yet erupted and is still in its socket, only its upper surface being visible from outside (Figs. 4 and 12). The left third lower molar is not visible externally and is also not seen in the skiagram of this lower jaw (See Fig. 11). Thus it is seen that the eruption of the wisdom teeth of this individual has been delayed, as in the modern Europeans.*" [32]

In the Alaca Höyük skull No. VIII of the Copper Age, described by me,[40] all the upper and lower milk teeth are still functioning. Upper and lower first permanent molars have just begun to erupt,[41] whereas the upper and lower central permanent incisors are still within their sockets and unerupted. It is clear that in this child the upper and lower first permanent molars precede the upper and lower permanent central incisors in eruption.

In Alaca Höyük individual Al.F. No. I of Copper Age, the permanent teeth have made their appearance with the exception of the upper and lower wisdom teeth, one of the upper second permanent molars and the right and left lower second premolars. [42] In the upper jaw of this individual the left second permanent molar is unerupted and in its alveolus, while the eruption of the right second permanent molar is nearing completion.[43] The lower second

[38] Şenyürek, 1951B, p. 46. For photographs of the teeth see Şenyürek, 1951B, figs. 4, 11 and 12.

[39] Ibid., p. 46.

[40] Şenyürek, 1950, pp. 71-72.

[41] See ibid., fig. 3 and Şenyürek, 1952B, figs. 4 and 30.

[42] Şenyürek, 1951B, pp. 48-49.

[43] For photographs of the upper and lower teeth of this individual see Şenyürek, 1951B, figs. 8 and 13.

permanent molars of this individual are erupted, while both the right and left lower second milk molars are still in place and functioning. From the account given it is clear that in the upper jaw of this individual the canines and the first and second premolars precede the second permanent molars in eruption, while in the lower jaw the second premolars erupt later than the second permanent molars.

In Alaca Höyük individual No. III of Copper Age, described by me,[44] the upper first permanent molars, upper central and lateral permanent incisors and the upper first and second premolars have completed their eruption (figs. 12-13). The eruption of the upper permanent canine is nearing completion, while the upper second permanent molars are about 1/4th erupted. It is clear that in the upper jaw of this individual the second permanent molar erupts later than the permanent canines and the first and second premolars, the canine appearing after the premolars. This condition is quite similar to that found in the majority of recent whites. In the lower jaw (figs. 14-16) the permanent teeth in front of the second permanent molar are erupted, the second permanent molar being about 1/4th erupted. It is clear that in the lower jaw also the permanent canine and the first and second premolars erupted before the second permanent molar, which is again the condition found in the majority of recent whites.

In skull No. II, a subadult individual of about 17 years of age, from the Copper Age, all the upper and lower permanent teeth, with the exception of upper and lower third molars, have appeared.[45] In the subadult individual No. IX, of 17-18 years of age, again belonging to the Copper Age, with the exception of the upper and lower third molars and the upper right lateral incisor, which is congenitally missing (see fig. 17), all other permanent teeth are already in place. [46]

The Skulls from Kusura:

In the subadult individual from grave 6, of late Chalcolithic Age, represented by a mandible and a couple of small cranial frag-

[44] Şenyürek, 1950, pp. 72-74.
[45] See Şenyürek, 1950, p. 75.
[46] See Şenyürek, 1951A, pp. 254 and 256.

ments, all the lower permanent teeth, with the exception of third molars, have made their appearance. [47] In the mandible of child No. V.S.W.C. 94A, from the Copper Age, the first permanent molars and, to judge by their preserved alveoli, the central and lateral permanent incisors have erupted. The milk canines, which have been lost after death, and the two milk molars are still functioning. [48] As the second permanent molars, the premolars and the permanent canines are still deeply buried in the mandible, it is not possible to say whether the second permanent molars erupt before or later than the permanent canines and premolars.

The Skulls from Polatlı:

In individual No. 2 from the early Copper Age, which represents an adolescent of 13-15 years of age and probably of male sex, as described before, all the upper and lower permanent teeth, with the exception of upper and lower third molars, are in place. [49]

The Skulls from Ahlatlıbel:

Among the Copper Age skeletons from this site, in two the eruption of the permanent teeth is not complete. In individual No. 15, all the upper and lower milk teeth were functioning at the time of death. [50] Only the upper and lower first permanent molars have been added to these. On the other hand, in both the upper and lower jaws, the permanent central incisors are still embedded within their alveoli, the lower tooth being nearer to the alveolar margin than the upper one. Thus it is clear that in this individual the upper and lower first permanent molars preceded the lower and upper central permanent incisors in eruption. The positions of the lower and upper central permanent incisors within the bone, suggest that the lower tooth may erupt before the upper one.

In individual C, of 17-19 years of age, from this site, all the upper and lower permanent teeth, with the exception of the upper and lower third molars, have erupted. The maxillary and mandibular third molars are still unerupted, but the upper one appears to be readier to erupt than the lower one.

[47] For the photograph of this mandible see: Şenyürek, 1952A, fig. 12.
[48] For the photograph of this mandible see: ibid., fig. 2.
[49] See Şenyürek, 1951C, p. 63.
[50] Some of the deciduous teeth have been lost after death.

The skulls from the sites around Samsun:

In skull No. 1, of Copper Age, from Kaledoruğu, which belongs to a child of about 7 years of age, only the upper and lower first permanent molars have been added to the milk teeth. [51] The upper and lower central permanent incisors are still unerupted. It is evident that in this individual the upper and lower first permanent molars erupted before the lower and upper central permanent incisors. It also appears that the lower central permanent incisor is readier to erupt than the upper central permanent incisor.

In the subadult individual No. VII of Copper Age from Kaledoruğu, all the upper and lower permanent teeth, with the exception of the upper and lower third molars, have erupted.

The skulls from Maşat Höyük:

Among the Copper Age specimens from Maşat Höyük, described by me, in two (Nos. 3 and 7) all the upper and lower permanent teeth, with the exception of third molars, have appeared.[52]

The skulls from Alişar Höyük :

Of the Chalcolithic and Copper Age skulls from Alişar Höyük, [53] only two (Nos. b-x8 and c-x20), belonging to the Copper Age, are preserved in the Division of Palaeoanthropology of the University of Ankara. In one of these (No. c-x20) representing an aged male, all the permanent upper and lower teeth, with the only exception of right upper third molar, have erupted, the right third upper molar being impacted.

To sum up, it can be stated that the available evidence indicates that among the Chalcolithic and Copper Age inhabitants of Anatolia, both the upper and lower first permanent molars erupted before both the upper and lower central permanent incisors, which is the primitive condition occurring in the modern anthropoid apes.[54] The same situation is also seen in the available mandibles of *Australo-*

[51] Şenyürek, 1951A, p. 248.

[52] Şenyürek, 1946, pp. 244 and 247.

[53] For skulls from Alişar Höyük see Krogman, 1937.

[54] See Clements and Zuckerman, 1953, pp. 316-317 and Schultz, 1935, tables 16-19. As I noted before (Şenyürek, 1955, p. 413), the reverse condition where the lower first incisor appears before the lower first molar occurs extremely rarely in the gibbons studied by Schultz (see Schultz, 1944, table 17).

pithecus,[55] and Peking man (now attributed to *Pithecanthropus*).[56] On the other hand, among the recent whites, for which we have sufficient information, the order of eruption of the lower first permanent molar relative to the lower central permanent incisor is as was stated before variable, in some the former, and in others the latter tooth preceding the other in eruption.[57]

As for the sequence of eruption of the premolars and permanent canines relative to the second permanent molars, in the Chalcolithic individuals from Fikirtepe (No. B) and Troy (No. 1 Tr.), lower premolars erupt later than the lower second permanent molars, which is the primitive condition seen in the anthropoid apes, [58] and the early fossil hominids.[59] This primitive condition is also seen, to varying degrees, in some of the recent primitive peoples, as well as even in some of the recent whites.[60] On the other hand, the prim-

[55] See Şenyürek, 1955, pp. 412-413 and Clements and Zuckerman, 1953, p. 324.

[56] See Weidenreich, 1937, p. 122 and Şenyürek, 1955, p. 423.

[57] See Şenyürek, 1955, p. 438. For the variation occurring in the order of eruption of lower first molar relative to lower first incisor in recent whites see: Schultz, 1935, table 4; Steggerda and Hill, 1942, table III; Schultz, 1950, fig. 7; Clements, Davies-Thomas and Pickett, 1953A, table VI; Clements and Zuckerman, 1953, p. 322.

[58] See Schultz, 1935, tables 16-19; Schultz, 1950, fig. 7; Clements and Zuckerman, 1953, tables 1 and 2.

[59] For literature on fossil hominids see Şenyürek, 1955.

[60] Drennan, the eminent South African anthropologist, has shown the occurrence of this primitive condition in all the four mandibles of recent Bushmen studied by him (Drennan, 1932, p. 493). According to Drennan the same condition also appears in the maxillary teeth of this race from the Kalahari desert (Drennan, 1932, p. 493). According to Campbell (1925, pp. 54-55) in the recent Australian aborigines the two premolars, in both the upper and lower jaws, precede the second permanent molars in eruption, which represents the advanced condition. However, as I stated before (Şenyürek, 1955, p. 436), the primitive condition is still retained in at least some individuals of Australian aborigines. That is, the order of eruption of the permanent teeth of the indigenous population of Australia is still variable, although the condition where the premolars precede the second permanent molar in eruption is the more frequent occurrence (see Şenyürek, 1955, p. 436). According to the mean times of eruption given by Steggerda and Hill, in Navajos and Mayas studied by them, the premolars precede the second permanent molars in eruption in both the upper and lower jaws, with the exception of the male Maya series in which the lower second premolar, on the average, erupts later than the

itive condition where both premolars erupt later than the second permanent molars is seen only on the right side of the maxilla of the Chalcolithic individual B from Fikirtepe, while on the left side

lower second permanent molar (see Steggerda and Hill, 1942, table III). However, as was stated previously (Şenyürek, 1955, p. 436), the pictures of the mandible of an American Indian child from Tarasco published by Gregory and Hellman (1926, pl. XVIII, fig. D and pl. XIX, upper figure) clearly shows that not only the two premolars, but also the permanent canine, erupt after the second molar (for Tarasco Indians see also Bay, 1946/47, p. 5). Thus it is seen that the primitive condition is still retained at least sporadically among the recent American Indians. In Zulus of South Africa studied by Suk (see Suk, 1919 and Shaw, 1931) and the American southern Negroes, investigated by Steggerda and Hill (1942, table III), on the average, the premolars in both the upper and lower jaws precede the second permanent molars in eruption, which is also the case in the majority of recent whites (for recent whites see: Schultz, 1935, table 4; Schultz, 1950, fig. 7; Steggerda and Hill, 1942, table III; Clements, Davies-Thomas and Pickett, 1933A, table VI). However, in the Birmingham series of modern Britishers studied by Clements, Davies-Thomas and Pickett (Clements, Davies-Thomas and Pickett, 1953A, table VI, 1953B, table I; Clements and Zuckerman, 1953, p. 322) and in the recent New Zealanders studied by Leslie (Leslie, 1951, cited by Clements, Davies-Thomas and Pickett, 1953A, table VI) the lower second premolar succeeds the lower second molar in eruption, instead of preceding it as it does in other recent white groups. In this feature the Birmingham series of Britishers differs from Ainsworth's recent British series (Ainsworth, 1925, cited by Clements, Davies-Thomas and Pickett, 1953 A, table VI)in which both the upper and lower premolars precede the second permanent molars in eruption, the difference between the two British series being probably in the main a result of sampling (Şenyürek, 1955, p. 439). But still it is evident that in modern Britishers, as well as in New Zealanders, there is an inherent tendency to have the lower second premolar appear after the lower second molar in eruption (see Şenyürek, 1955, p. 439). The same tendency is also seen in the lower jaw of Hindus from Lahore studied by Shourie, in which P_2 on the average erupts after M_2, whereas in the upper jaw of Lahore and upper and lower jaws of Madras series, again on the average, the two premolars precede the second molar in eruption (see Shourie, 1946, table IV).

As for the variation occurring in the order of eruption in recent whites, as can be seen from a table published by Clements, Davies-Thomas and Pickett (1953B, table III), the primitive condition where not only the premolars but also the permanent canines erupt after the second molars, still occurs in both the upper and lower jaws of modern Britishers. The percentage of the cases where only the two premolars succeed the second molars in eruption is indeed quite high in the lower jaws of the modern Britishers (see Clements, Davies-Thomas and Pickett, 1953B, table III). That is, noticeable traces of the primitive condition are still encountered among the recent whites.

of this maxilla the first premolar precedes the second permanent molar, the second premolar erupting at about the same time as the second molar. In the upper jaw of the Chalcolithic child from Troy I the first premolar erupts before the second molar, whereas the second premolar appears after the second molar. Thus the sequence of eruption of the upper premolars relative to the upper second molar in this child from Troy I is intermediate between the primitive condition and the advanced mode seen in the majority of recent whites. The condition observed on the left side of the maxilla of individual B from Fikirtepe is, strictly morphologically speaking, more advanced than that seen in the child from Troy I (No. 1 Tr.).

As for the Copper Age inhabitants of Anatolia, among the available crania a trace of the primitive condition is retained only in the mandible of individual Al.F. No. 1 from Alaca Höyük, in which the lower second premolar erupts later than the lower second permanent molar. On the other hand, in the upper jaw of this individual (Al.F. No. 1), as well as in the upper and lower jaws of individual No. III from Alaca Höyük and individual No. 2 Tr. from Troy, both the first and second premolars erupt before the second permanent molars, as in the majority of recent whites. Although the available Anatolian series from the Chalcolithic and Copper Ages is too small, still, as far as the present material is concerned, the advanced condition seems to be more frequent in the Copper Age than in the preceding period, as is expected.

As for the sequence of eruption of the permanent canines relative to the second permanent molars, discounting the impacted upper permanent canines of the individual from Level VII of Tabara, in the Chalcolithic skulls from Fikirtepe (No. B) and Troy I (No. 1 Tr.) the upper permanent canine erupts later than the upper second permanent molar, which is a more primitive condition than that obtaining in the majority of recent whites.[61] On the other

[61] In the majority of modern whites, as well as in the majority of recent primitive peoples, in whom the sequence or the time of eruption of the permanent canines have been studied, the permanent canines, in upper and lower jaws, precede the second permanent molars in eruption, although as has already been noted (see footnote 60) there is still some variation in recent man where the permanent canine may erupt later than the second molar. For the relative time of eruption of the permanent canines in modern whites and recent primitive peoples see: Broca, 1875;

hand, the sequence of eruption of the permanent canine relative to the second permanent molar in the mandibles of Chalcolithic inhabitants of Anatolia appears to be variable. In the lower jaws of the Chalcolithic individuals from Fikirtepe (No. B) and Troy I (No. 1 Tr.) the permanent canine erupts later than the second permanent molar which is again, relatively speaking, the more primitive condition, while in the mandibles from Yümüktepe (No. H. 2) and level VI of Tabara, the permanent canine appears to precede the second permanent molar in eruption, which represents the advanced condition. Coming to the skulls from the Copper Age, in the available specimens, where a determination is possible (upper jaw of individual Al.F. No. 1 and upper and lower jaws of individual III from Alaca Höyük and individual No. 2 Tr. from Troy), the upper and lower permanent canines precede the upper and lower second permanent molars in eruption. Again the advanced condition seems to be more frequent in Copper Age than in the Chalcolithic period.

The photographs of the upper and lower jaws showing the orders of eruption of the permanent canines and the premolars relative to the second permanent molars in five ancient Anatolian skulls,[62] ranging in date from about 2000 B.C. down to the Early Turkish period, are shown in figs. 18-27. These photographs show in upper and lower jaws both the primitive condition where the permanent canines

Suk, 1919; Tomes, 1923, p. 230; Campbell, 1925, pp. 54-55 and pl. XXXIV, fig. 1; Martin, 1928, fig. 267; Shaw, 1931, table LI; Schultz, 1935, table 4 and fig. 2; Steggerda and Hill, 1942, table III; Shourie, 1946, tables 4-5; Schultz, 1950, fig. 7; Broom and Robinson, 1952, p. 89; Clements, Davies-Thomas and Pickett, 1953A, tables I and VI; Clements, Davies-Thomas and Pickett, 1953B, tables I and III; Clements and Zuckerman, 1953, p. 322.

[62] These five specimens are the only ones showing the order of eruption of the permanent canines and premolars relative to the second permanent molar in post-Copper Age skulls from Alaca Höyük, Alişar Höyük, Arslantepe, Karahöyük, Karaoğlan, Kültepe (season of 1948), Kusura, Pazarlı and Polatlı, which are preserved in the Division of Palaeoanthropology of the University of Ankara. In recent years a larger series of skeletons from Gordion (Yassı Höyük), Kültepe (seasons of 1949-1955) and Yazılıkaya have been added to the collection of the Division of Palaeoanthropology. After this additional and large series is cleaned, repaired and studied, the subject of the order of eruption in the post-Copper Age populations of Anatolia will be taken up in detail. At the same time I will start a study of the time and order of eruption of the permanent teeth in modern Turkish children.

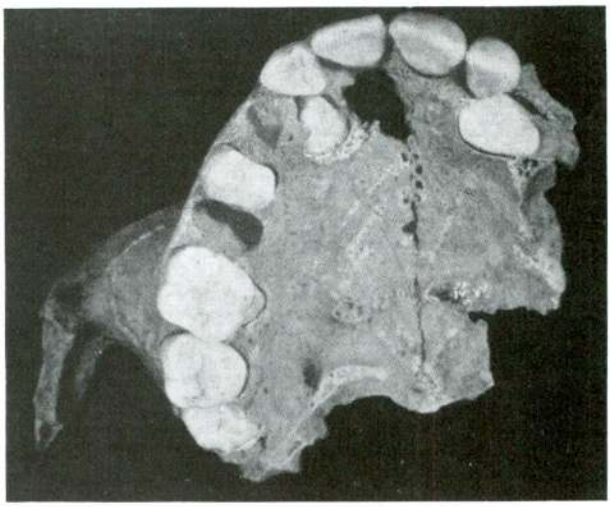

Fig. 1

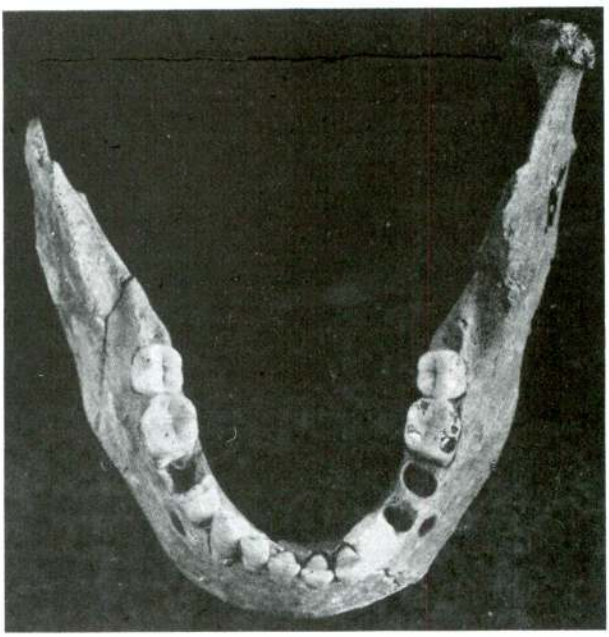

Fig. 2

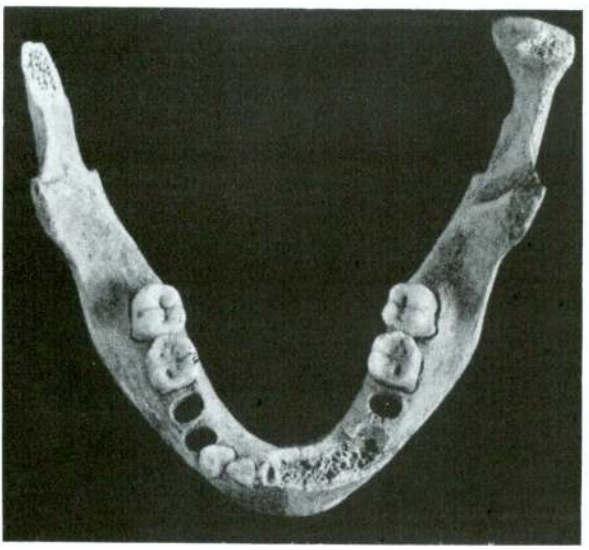

Fig. 3

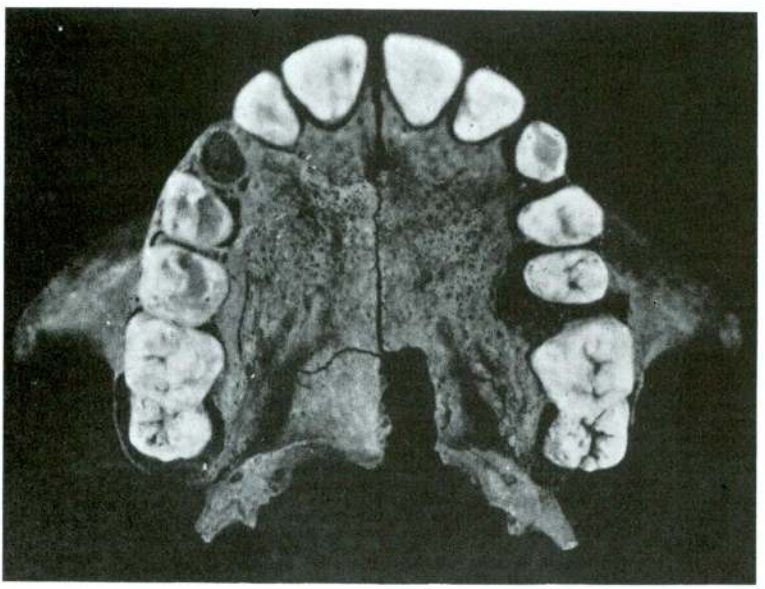

Fig. 4

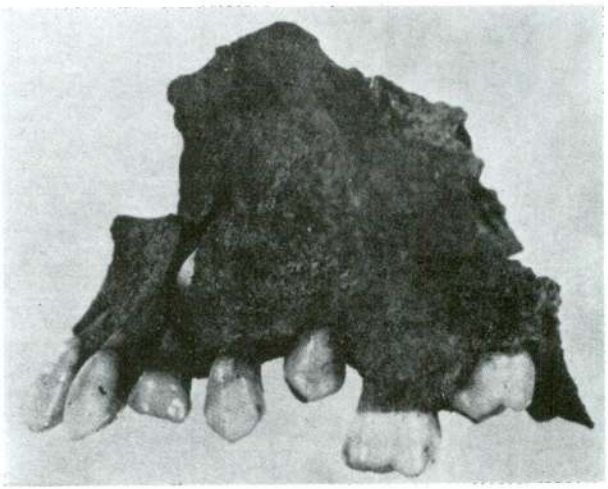

Fig. 5

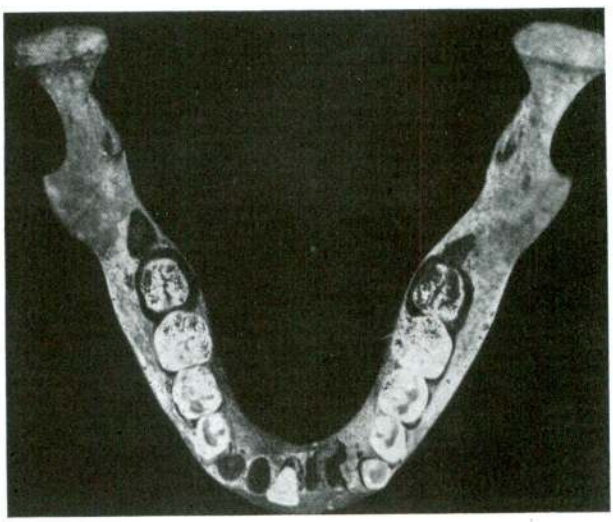

Fig. 6

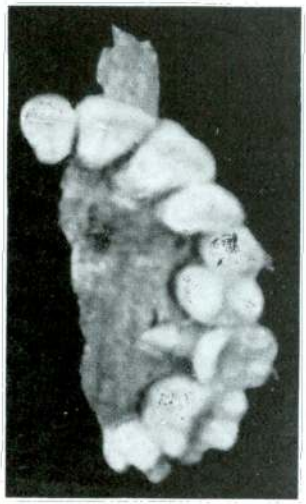

Fig. 7

Fig. 8

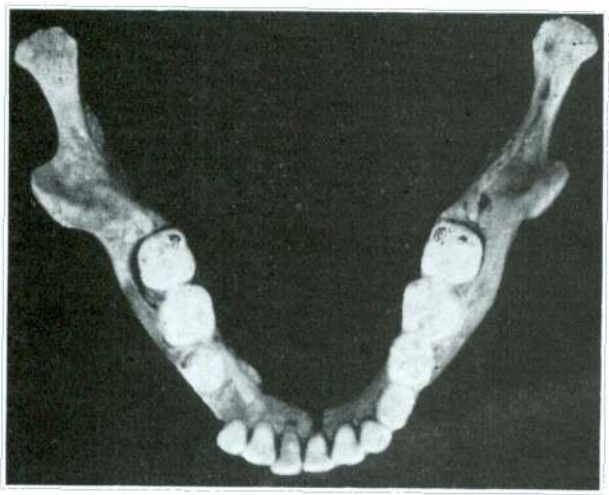

Fig. 9

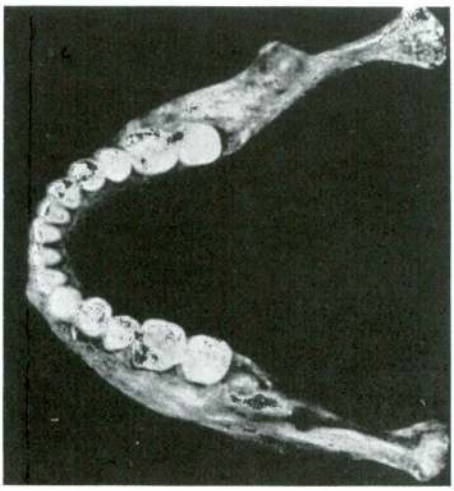

Fig. 11

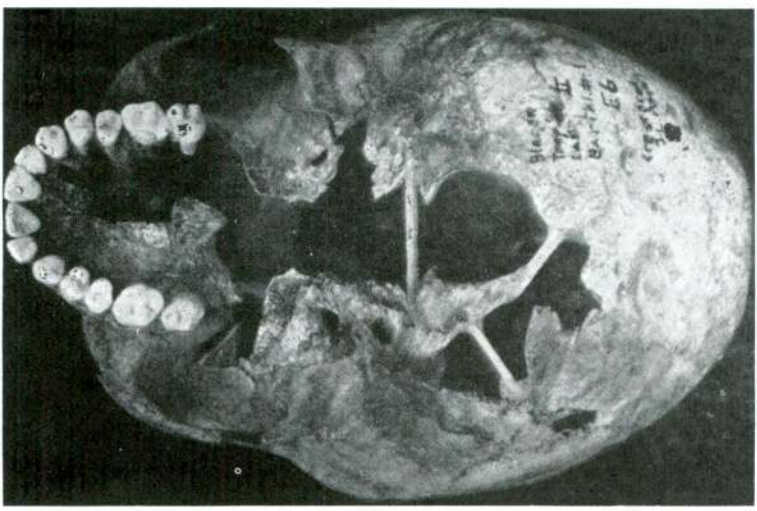

Fig. 10

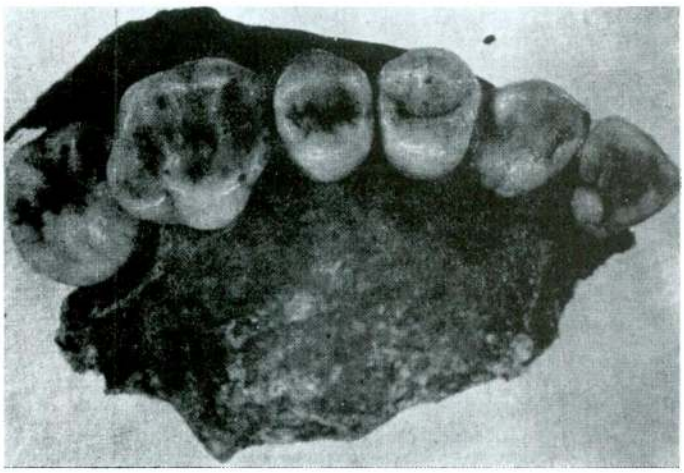

Fig. 12

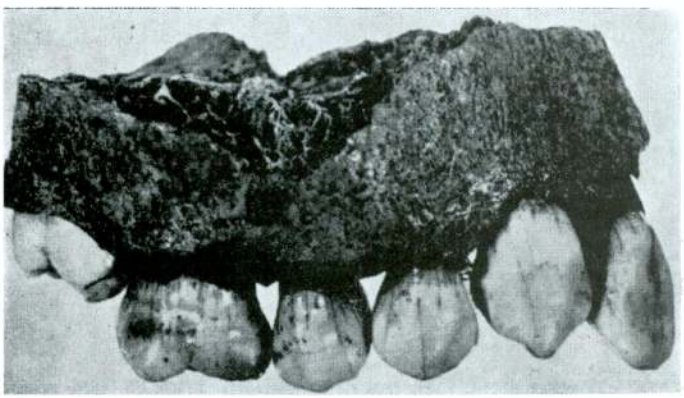

Fig. 13

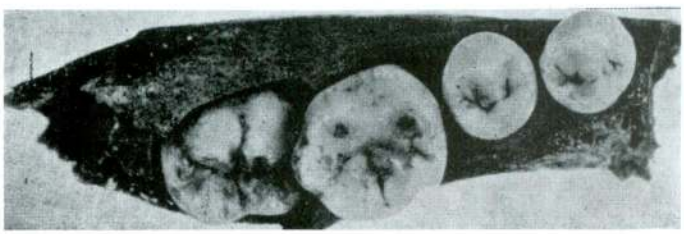

Fig. 14

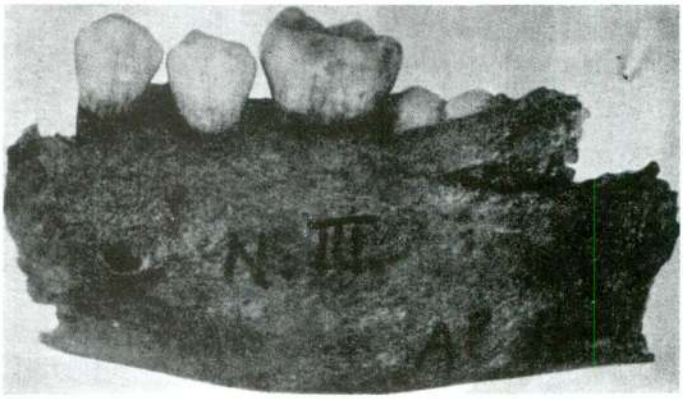

Fig. 15

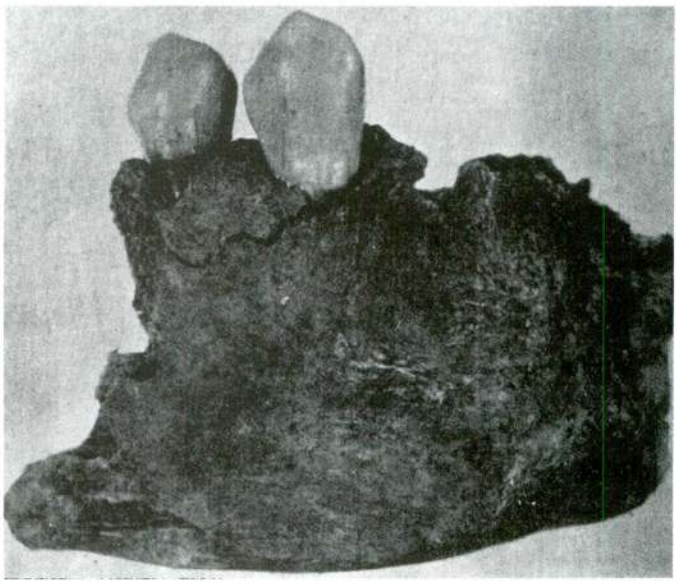

Fig. 16

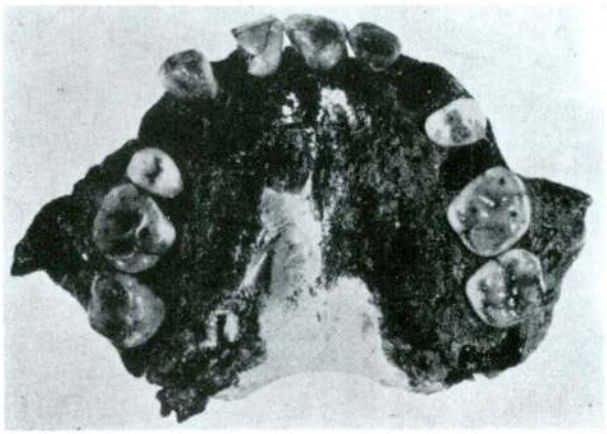

Fig. 17

Fig. 18

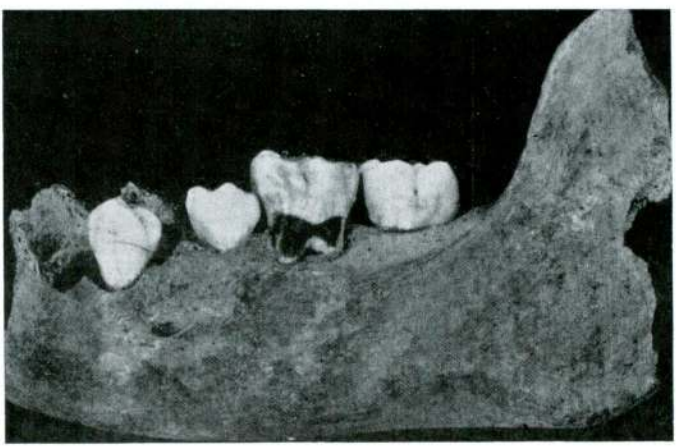

Fig. 19

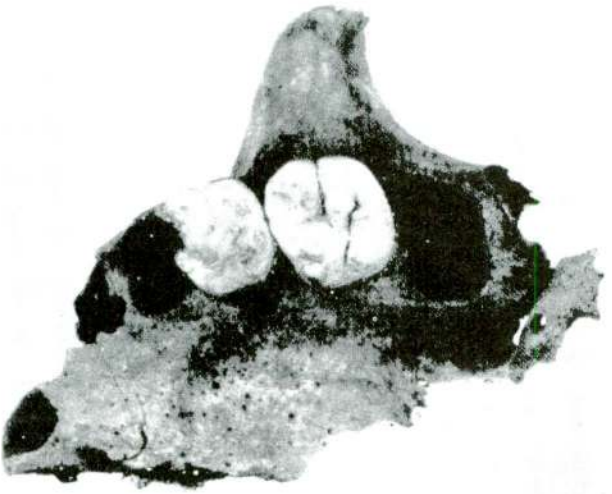

Fig. 20

Fig. 21

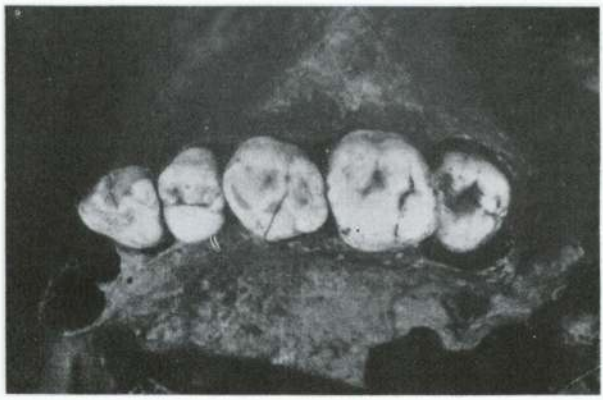

Fig. 22

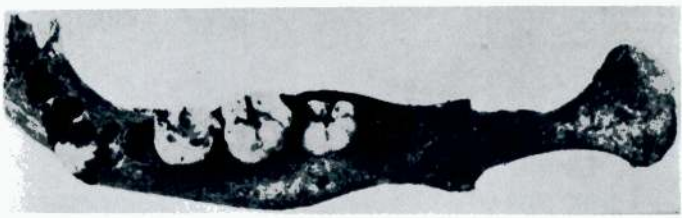

Fig. 23

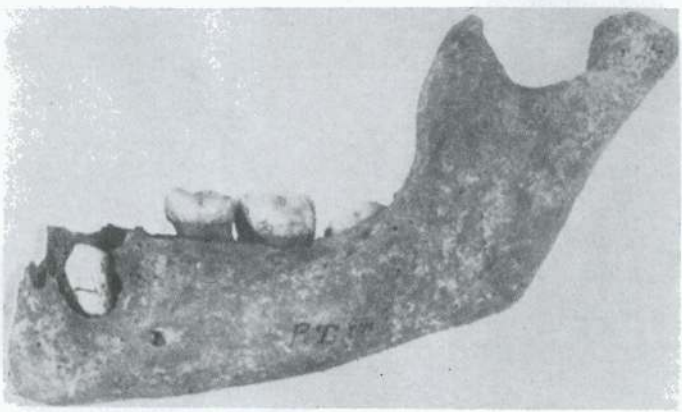

Fig. 24

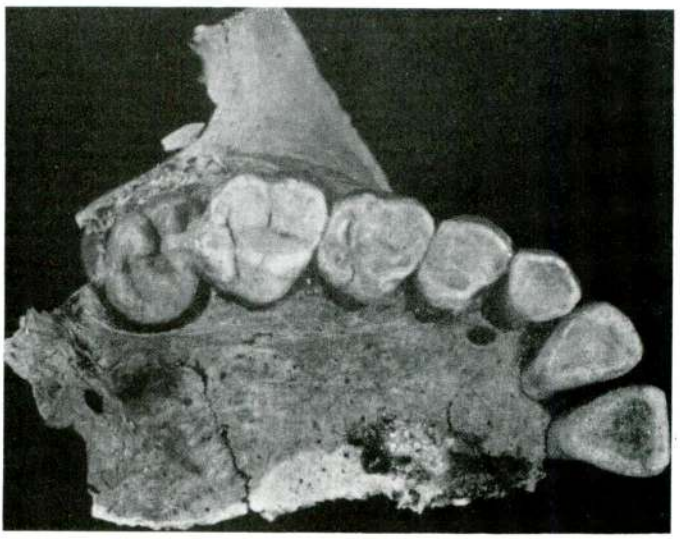

Fig. 25

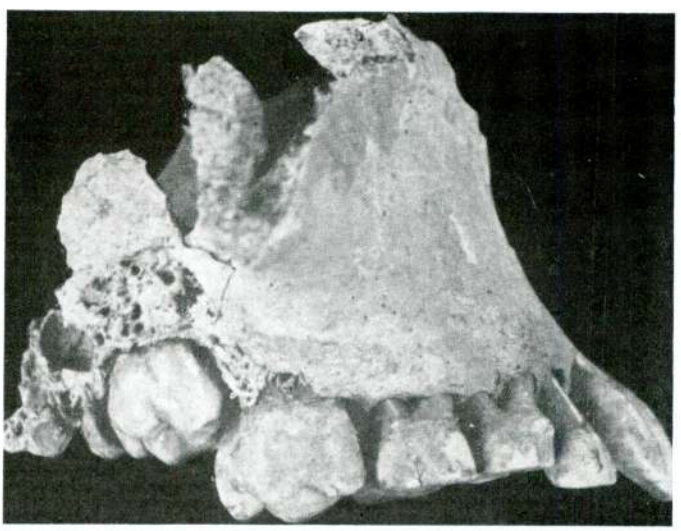

Fig. 26

Fig. 27

Fig. 28

and premolars erupt before the second permanent molars, as well as transitional stages toward the modern condition seen in the majority of recent whites where the permanent canines and premolars precede the second permanent molars in eruption. [63] The conditions existing in these later specimens indicate that in the earlier Chalcolithic and Copper Ages, and especially in the Chalcolithic period, more frequent occurrence of the primitive condition where the permanent canine and premolars succeed the second permanent molars in eruption is to be expected to occur not only in the lower but also in the upper jaws.

Regarding the Neolithic to recent peoples of Europe, Bay briefly states: "*Während bisher bekannt war, dass die Anthropus- (Sinanthropus), die Neandertalensisfunde (Ehringsdorf und Krapina) und der Homo sapiens diluvialis des Jungpalaeolithicums (Afalou und Grimaldi) die alte, simultane, bisher 'palaeolithische' genannte Zahnfolge aufweisen, wird hier an Hand der neolithischen Funde von Aesch (Baselland), des Schädels von der Bsetzi (Schaffhausen) und der Fillet néolithique de Laugerie basse (Dordogne) dargelegt, dass die alte Zahnfolge auch beim Neolithiker die Regel darstellt. Aus der Bronze-bis La-Tène-Zeit fehlen die Kinderschädel. Hingegen fand sich die alte Zahnfolge auch noch mehr oder weniger häufig beim frühhistorischen Alamannen der Völkerwanderungszeit und dem mittelalterlichen Basler. In der Neuzeit ist sie selten und in abgeschwächter Form zu finden.*" [64] This short account, as I stated before, [65] shows that the primitive conditions in the sequence of eruption of the permanent teeth continued in some Neolithic and historic populations of Europe. However, it does not tell us the range of variation occurring in the sequence of eruption and also whether the permanent canines and the two premolars as a whole, or only the premolars erupted after the second permanent molars. [66]

[63] It may be mentioned here that in one skull of the Roman period from Alişar Höyük (No. d-x13) both the upper and lower first permanent molars are erupted, while the upper and lower central milk incisors are still *in situ*. In the maxillae of two skulls from Alişar Höyük (Nos. b-x51 and b-x52), belonging to the Turkish period, upper first permanent molars erupt before the upper central permanent incisors.

[64] Bay, 1946/47, p. 4.

[65] Şenyürek, 1955, p. 435.

[66] Bay (1946/47, p. 5) states regarding the recent primitive races: "*Auch stellten verschiedene Forscher fest, dass die alte, simultane, sog. 'palaeolithische' Zahnfolge*

The skiagram of the mandible of an ancient Athenian child published by Philippas, [67] as I noted before, [68] clearly shows that both premolars erupt after the second permanent molar. The skiagram of another and younger ancient Athenian child published by Philippas, [69] again as I stated before, [70] shows that the lower second permanent molar is just below the alveolar margin and ready to erupt, while the first and second premolars are deeply embedded in the mandible, below the first and second deciduous molars.

From the study of ancient Anatolians and the additional evidence from Europe, it is seen that the primitive conditions in the order of eruption of the permanent teeth occurred not at all infrequently among the ancient peoples of the white stock and indeed till quite recently. The study of the Chalcolithic and Copper Age inhabitants of Anatolia shows that the genetic changes which brought about a shift from the primitive to the advanced mode of eruption, where the permanent canines and premolars erupt before the second molars, took place in the white stock before the end of the fourth millenium B.C., and probably earlier. But still the available evidence indicates that the high frequency of the advanced mode of eruption, seen in the majority of recent whites, is, relatively speaking, a recent development. The variation occurring in recent whites, some of whom still retain the primitive condition, where the permanent canine and premolars erupt after the second molars, clearly demonstrates that the process of change from the primitive to the advanced mode of eruption is not yet complete in the white stock.

The study of the order of eruption of the permanent teeth in fossil hominids and the available comparative data on recent man, leave no doubt that all recent races of *Homo sapiens* have passed

für verschiedene Rassen, wie Papuas, Neu-Caledonier, Buschmänner, Tarasco-Indianer von Nord-Mexiko typisch ist, so dass diese alte Zahnfolge als rassisch bedingt angesehen werden muss." So it appears that the primitive conditions in the sequence of eruption, in addition to the other groups already discussed, also occurs in the New Caledonians and Papuans.

[67] Philippas, 1952, fig. 8.
[68] Şenyürek, 1955, p. 434.
[69] Philippas, 1952, fig. 7.
[70] Şenyürek, 1955, pp. 434-435.

through a stage where the permanent canines and the premolars erupted later than the second permanent molars. [71] It is also evident that the modification of this ancestral pattern has not developed at the same rate in all recent races of man, as a result of which some recent races still retain more of the primitive condition, while in others it has been replaced to various degrees by the advanced condition. [72]

In all the available ancient Anatolian crania, the lower first permanent molar (M_1) erupts before the lower central permanent incisor (I_1), which is the primitive condition, that, as we have already seen, occurs in the living anthropoid apes, *Australopithecus* and Peking man. On the other hand, as I have already stated, the order of eruption of these two teeth relative to each other is variable in recent whites, in some cases M_1 and in others I_1 preceding the other in eruption. [73] The evidence of ancient Anatolians indicates that the genetic change which brought about the eruption of the lower central permanent incisor before the lower first permanent molar in the white stock took place fairly recently. [74] Furthermore, the evidence indicates that the change in the order of eruption of M_1 and I_1, in at least the white stock, took place later than the changes which brought about the eruption of permanent canines and premolars before the second molars.

ERUPTION OF THE THIRD MOLARS AMONG THE CHALCOLITHIC AND COPPER AGE INHABITANTS OF ANATOLIA

In my earlier studies on the longevity of the ancient Anatolians,[75] I had determined the ages of the ancient Anatolian crania by means of eruption stages of the teeth, the state of synostosis of the sutures

[71] See ibid., p. 440.

[72] Ibid., p. 440.

[73] Ibid., p. 438.

[74] The eruption of M_1 before I_1 in ancient Anatolians further shows that the occurrence of the reverse condition, where I_1 precedes M_1 in eruption,in at least one individual of Swartkrans ape-man (described by Broom and Robinson, 1952, p. 88) has been acquired independently from that of some recent men (see Şenyürek, 1955, p. 421). As I stated before, the order of eruption of the permanent teeth in the upper jaw of the Swartkrans ape-man has also been developed independently from that of some *Homo sapiens* (see Şenyürek, 1955, p. 440).

[75] Şenyürek, 1947 and 1951D.

and in some cases by the state of union of the epiphyses of the long bones. Among the Chalcolithic and Copper Age crania studied,[76] sixty-nine belong to individuals over 20 years of age, in which the regions of the wisdom teeth are preserved. In this material there are the remains of only four adult individuals in whom one or more wisdom teeth had a retarded eruption, or had not erupted or were missing. In one of these skulls (Alaca Höyük No. Al.H.M II) the right upper third molar is erupted and the eruption of the left upper third molar is nearing completion. In the mandible of this individual the right third molar is in its alveolus, while the left third molar is congenitally missing. In the second skull (Kumtepe No. 2), the left lower third molar is congenitally missing (fig. 28). Whether the right lower third molar is also congenitally missing or not is difficult to say, as this region of the mandible is damaged, while the upper wisdom tooth, at least on the left side, is erupted. In the third individual (Alişar Höyük No. c-x20) the right upper third molar is impacted, this being the only wisdom tooth in this aged individual that had not erupted. The wisdom teeth of the fourth individual (Troy No. 3 Tr.) are described by Angel as "*suppressed*".[77]

Among the remains of these 69 adult individuals there are 35 upper jaws and 65 mandibles. Taking the upper jaws it is seen that the wisdom teeth are retarded in one (2.8%), impacted in one (2.8%) and "*suppressed*" in one (2.8%). Taking the lower jaws, the wisdom teeth are congenitally missing in two individuals (Al.H.M II and Kumtepe 2). Assuming that the wisdom teeth of Troy No. 3 Tr. described as "*suppressed*" by Angel[78] mean that these teeth were not formed, amongst the 65 mandibles there are three with congenitally missing third molars (4.6%). Thus the congenitally missing wisdom teeth appear to be relatively rare among the Chalcolithic and Copper Age inhabitants of Anatolia.[79]

[76] These 69 individuals include the Chalcolithic and Copper Age individuals from Ahlatlıbel, Alaca Höyük, Alişar Höyük, Babaköy (specimens collected by Docent Dr. Kılıç Kökten), Büyük Güllücek, Fikirtepe, Kusura, Maşat Höyük, Copper Age sites around Samsun, Sarıyer, Şeyh Höyük, Tilkitepe, Yümüktepe and Troy skull No. 3 Tr., the last having been taken from Angel's (1951) study.

Of these 69 individuals in slightly less than half both the upper and lower jaws are preserved, while the rest is represented by either the lower or upper jaws.

[77] Angel, 1951, p. 7. [78] Ibid., p. 7.

[79] For the congenitally missing third molars among the infrahuman primates

Amongst the 69 Chalcolithic and Copper Age individuals, 17 are of 20-22 years of age. In these 17 individuals, with the only exception of Kumtepe No. 2 described before, the wisdom teeth are erupted. Thus the available evidence indicates that in the majority of the Chalcolithic and Copper Age inhabitants of Anatolia the wisdom teeth had erupted before the age of 20, which is a primitive condition seen amongst the Mesolithic peoples of Afalou[80] and Téviec [81] and recent Zulus,[82] while in recent whites the eruption of one or more wisdom teeth is not infrequently delayed till later.[83]

SUMMARY AND CONCLUSION

1. The Chalcolithic and Copper Age inhabitants of Anatolia, in the order of eruption of the permanent teeth, exhibit both the primitive condition, where the permanent canines and premolars erupt after the second permanent molars, and the advanced condition, where the permanent canines and premolars appear before the second permanent molars, as well as transitional stages between these.

As far as the present material is concerned the frequency of advanced condition appears to increase in passing from Chalcolithic to Copper Age. The study of later material from Anatolia indicates that a higher frequency of primitive condition is expected in Chalcolithic and Copper Ages, especially in the earlier period.

Although the study of Chalcolithic and Copper Age inhabitants of Anatolia shows that the genetic changes, which brought about a shift from the primitive toward the modern condition in the order of eruption of permanent canines and premolars relative to second molars, had taken place before the end of the fourth mil-

see Schultz, 1935, table 21 and for the congenitally missing third molars in recent man see: Dahlberg, 1945, table 9; Goldstein, 1948, pp. 71-72; Pedersen, 1949, pp. 46-59; Dahlberg, 1951, table 34; Lasker, 1951, pp. 193-195.

[80] Boule, Vallois and Verneau, *in* Arambourg, Boule, Vallois and Verneau, 1934, p. 146.

[81] Boule and Vallois, *in* Péquart (Marthe and St.-Just), Boule and Vallois, 1937, p. 138.

[82] See Suk, 1919.

[83] See Broca, 1875, p. 131; Hrdlička, 1939, pp. 43-44.

lenium B.C. and probably earlier, the available evidence from Anatolia as well as from Europe indicates that the high frequency of advanced condition, characteristic of the majority of recent whites, is a relatively recent development.[84]

2. In the Chalcolithic and Copper Age inhabitants of Anatolia the lower first permanent molar erupted before the lower central permanent incisor, which is the primitive condition seen in the anthropoid apes, *Australopithecus* and Peking man. In recent whites the order of eruption of the lower first permanent molar relative to the lower central permanent incisor is variable, in some groups I_1 and in others M_1 being the first tooth to appear. The occurrence of the primitive condition in Chalcolithic and Copper Age Anatolians shows that the condition occurring in some recent white groups where I_1 erupts before M_1 is a fairly recent development.

The available evidence indicates that the genetic change which brought about the eruption of I_1 before M_1 took place, in at least the white stock, later than the changes which brought about the eruption of the permanent canines and premolars before the second permanent molars.

3. In the majority of the Chalcolithic and Copper Age inhabitants of Anatolia the wisdom teeth erupted before the age of 20, which is a primitive condition. The impacted and congenitally missing wisdom teeth also appear to be relatively rare among the Chalcolithic and Copper Age inhabitants of Anatolia.

4. According to the available evidence in the Chalcolithic and Copper Age inhabitants of Anatolia the permanent I_1 erupted before the permanent I^1 and the permanent M_2 preceded the permanent M^2 in eruption. On the other hand, the order of eruption of M_3 relative to M^3 was quite variable, in some cases M_3 and in others M^3 preceding the other in eruption.

[84] It should be noted here that regarding the phylogenetic changes in the order of eruption of permanent teeth in recent man Schultz (1935, p. 542) also stated: "*The human specializations consist in the rapid succession in eruption of the M1 and I1, in the complete replacement of the deciduous dentition before the M2 are being added to the permanent dentition, and in the appearance of the lower C before at least the P2. In other words, it is unquestionably a new and exclusive acquisition of man that his M2 erupt comparatively late and his Premolars and, particularly, Canines relatively early. It is perhaps more than a striking coincidence that this comparatively 'premature' appearance of the Canines of man is associated with a relative size of these teeth which is so markedly smaller than in any other primates of at least the male sex.*"

LITERATURE CITED

ANGEL, J. L. 1951. *Troy. The human remains.* Supplementary monograph I. Princeton University Press for the University of Cincinnati.

ARAMBOURG, C., BOULE, M., VALLOIS, H. and VERNEAU, R. 1934. *Les grottes paléolithiques des Beni Segoual (Algérie).* Archives de l'Institut de Paléontologie Humaine, Mémoire 13, Paris.

BAY, R. 1946—1947. *Die Zahndurchbruchsfolge in der menschlichen Stammesgeschichte.* Bulletin der Schweizerischen Gesellschaft für Anthropologie und Ethnologie, 23. Jahrgang, pp. 4-5.

BROCA, P. 1875. *Instructions craniologiques et craniométriques.* Mémoires de la Société d'Anthropologie de Paris, Vol. II, Series 2.

BROOM, R. and ROBINSON, J. T. 1952. *Swartkrans ape-man Paranthropus crassidens.* Transvaal Museum Memoir No. 6, Pretoria.

CAMPBELL, T. D. 1925. *Dentition and palate of the Australian aboriginal.* University of Adelaide. Publications under the Keith Sheridan Foundation, No. 1. Adelaide.

CLEMENTS, E. M. B., DAVIES - THOMAS, E. and PICKETT, K. G. 1953(A). *Time of eruption of the permanent teeth in British children 1947—48.* British Medical Journal, Vol. i, June 27 (Reprint, 11 p.).

CLEMENTS, E. M. B., DAVIES - THOMAS, E. and PICKETT, K. G. 1953(B). *Order of eruption of the permanent human dentition.* British Medical Journal, Vol. i, June 27 (Reprint, 7 p.).

CLEMENTS, E. M. B. and ZUCKERMAN, S. 1953. *The order of eruption of the permanent teeth in the Hominoidea.* American Journal of Physical Anthropology, Vol. 11, N.S., No. 3, pp. 313-332.

DAHLBERG, A. A. 1945. *The changing dentition of man.* The Journal of the American Dental Association, Vol. 32, pp. 676-690 (*Reprinted in* Yearbook of Physical Anthropology, New York, 1954, published in 1946, pp. 48-62).

DAHLBERG, A. A. 1951. *The dentition of the American Indian. In:* Papers on the Physical Anthropology of the American Indian, delivered at the Fourth Viking Fund Summer Seminar in Physical Anthropology. Held at the Viking Fund, September, 1949, New York, pp. 138-176.

DRENNAN, M. R. 1932. *L'ordre d'éruption des dents permanentes chez les Boschimans.* L'Anthropologie, Vol. XLII, Nos. 5-6, pp. 491-495.

GARSTANG, J. 1953. *Prehistoric Mersin. Yümük Tepe in southern Turkey.* Oxford.

GOLDSTEIN, M. S. 1948. *Dentition of Indian crania from Texas.* American Journal of Physical Anthropology, Vol. 6, N.S., No. 1, pp. 63-84.

GREGORY, W. K. and HELLMAN, M. 1926. *The Dentition of Dryopithecus and the origin of man.* Anthropological papers of the American Museum of Natural History, Vol. XXVIII, Part I.

HOOD, S. 1951. *Excavations at Tabara El Akrad, 1948—49.* Anatolian Studies, Vol. 1, pp. 113-147.

HRDLIČKA, A. 1939. *Practical Anthropometry.* Philadelphia.

KANSU, Ş. A. 1937. *Kumtepe neolitik kemikleri üzerinde antropolojik tetkik. Etude anthropologique sur les ossements de Kumtepe (Troade).* Belleten, Vol. 1, No. 2, pp. 557-569 and 570-582.

KROGMAN, W. M. 1937. *Cranial types from Alişar Hüyük and their relations to other racial types, ancient and modern, of Europe and Western Asia. In* von der Osten's: *Alishar Hüyük, seasons of 1930—1932, part III.* OIP, Vol. XXX, Researches in Anatolia, Vol. IX, Chicago, pp. 213-293.

KROGMAN, W. M. 1949. *Ancient cranial types at Chatal Hüyük and Tell Al-Judaidah, Syria, from the late fifth millenium B.C. to the mid-seventh century, A.D.* Belleten, Vol. XIII, No. 51, pp. 407-477.

KRONFELD, R. 1935. *Development and calcification of the human deciduous and permanent dentition. In:* Stewart, T.D. and Trotter, M. 1954. *Basic readings on the identification of human skeletons: Estimation of age.* New York, pp. 3-10.

LASKER, G. W. 1951. *Genetic analysis of racial traits of the teeth.* Cold Spring Harbor Symposia on Quantitative Biology, Vol. XV, pp. 191-203.

MARTIN, R. 1928. *Lehrbuch der Anthropologie.* Vol. II, Jena.

ÖZGÜÇ, T. 1945. *Öntarihte Anadolu Kronolojisi.* Belleten, Vol. IX, No. 35, pp. 341-360.

PEDERSEN, P. O. 1949. *The East Greenland Eskimo dentition. Numerical variations and anatomy. A contribution to comparative ethnic odontography.* Kobenhavn.

PÉQUART, MARTHE and SAINT-JUST, BOULE, M. and VALLOIS, H. 1937. *Téviec, station-nécropole mésolithique du Morbihan.* Archives de l'Institut de Paléontologie Humaine, Mémoire 18, Paris.

PHILIPPAS, G. G. 1952. *Effects of function on healthy teeth: the evidence of ancient Athenian remains.* The Journal of the American Dental Association, Vol. 45, pp. 443-453.

SCHULTZ, A. H. 1935. *Eruption and decay of the permanent teeth in Primates.* American Journal of Physical Anthropology, Vol. XIX, No. 4, pp. 489-581.

SCHULTZ, A. H. 1944. *Age changes and variability in gibbons. A morphological study on a population sample of a man-like ape.* American Journal of Physical Anthropology, Vol. 2, N.S., No. 1, pp. 1-129.

SCHULTZ, A. H. 1949. *Ontogenetic specializations of man.* Archiv der Julius Klaus-Stiftung, Vol. 24, pp. 197-216.

SCHULTZ, A. H. 1950. *The physical distinctions of man.* Proceedings of the American Philosophical Society, Vol. 94, No. 5, pp. 428-449.

ŞENYÜREK, M. 1946. *Türk Tarih Kurumu adına yapılan Maşat Höyük kazısından çıkarılan kafataslarının tetkiki. Study of the skulls from Maşat Höyük, excavated under the auspices of the Turkish Historical Society.* Belleten, Vol. X, No. 38, pp. 231-242 and 243-254.

ŞENYÜREK, M. 1947. *A note on the duration of life of the ancient inhabitants of Anatolia.* American Journal of Physical Anthropology, Vol. 5, N.S., No. 1, pp. 55-66.

ŞENYÜREK, M. 1949. *Truva civarında Kumtepe'de bulunmuş olan iskeletlere dair bir not. A note on the skeletons from Kumtepe, in the vicinity of Troy.* Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi (Revue de la Faculté de Langue, d'Histoire et de Géographie, Université d'Ankara), Vol. VII, No. 2, pp. 295-299 and 300-304.

ŞENYÜREK, M. 1950. *Alaca Höyük'de bulunan üç kafatasına dair bir not. A note on three skulls from Alaca Höyük.* Belleten, Vol. XIV, No. 53, pp. 60-70 and 71-84.

ŞENYÜREK, M. 1951(A). *Two cases of premature suture closure among the ancient inhabitants of Anatolia.* Belleten, Vol. XV, No. 58, pp. 247-262.

ŞENYÜREK, M. 1951 (B). *A note on the human skeletons in the Alaca*

Höyük Museum. Ankara Üniversitesi Dil ve Tarih - Coğrafya Fakültesi Dergisi (Revue de la Faculté de Langue, d'Histoire et de Géographie, Université d'Ankara), Vol. IX, Nos. 1-2, pp. 43-61.

ŞENYÜREK, M. 1951(C). *A study of the human skulls from Polatlı Hüyük.* Anatolian Studies, Vol. I, pp. 63-71.

ŞENYÜREK, M. 1951(D). *The longevity of the Chalcolithic and Copper Age inhabitants of Anatolia.* Belleten, Vol. XV, No. 60, pp. 447-468.

ŞENYÜREK, M. 1952(A). *The dentition of the Chalcolithic and Copper Age inhabitants of Anatolia. Part I. A morphological study of the permanent lower molars of the Chalcolithic and Copper Age inhabitants of Anatolia.* Ankara Üniversitesi Dil ve Tarih - Coğrafya Fakültesi Dergisi (Revue de la Faculté de Langue, d'Histoire et de Géographie, Université d'Ankara), Vol. X, Nos. 1-2, pp. 57-77.

ŞENYÜREK, M. 1952(B). *A study of the dentition of the ancient inhabitants of Alaca Höyük.* Belleten, Vol. XVI, No. 62, pp. 153-224.

ŞENYÜREK, M. 1954. *A note on the skulls of Chalcolithic Age from Yümüktepe.* Belleten, Vol. XVIII, No. 69, pp. 1-25.

ŞENYÜREK, M. 1955. *A review of the order of eruption of the permanent teeth in fossil hominids.* Belleten, Vol. XIX, No. 76, pp. 407-444.

SHAW, J. C. M. 1931. *The teeth, the bony palate and the mandible in Bantu races of South Africa.* London.

SHOURIE, K. L. 1946. *Eruption age of teeth in India.* The Indian Journal of Medical Research, Vol. XXXIV, pp. 105-118.

STEGGERDA, M. and HILL, T. J. 1942. *Eruption time of teeth among Whites, Negroes and Indians.* American Journal of Orthodontics and Oral Surgery, Vol. 28, No. 6, pp. 361-370.

SUK, V. 1919. *Eruption and decay of permanent teeth in Whites and Negroes, with comparative remarks on other races.* American Journal of Physical Anthropology, Vol. II, No. 4, pp. 351-388.

TOMES, SIR C. S. (EDITED BY TIMS, H. W. M. and HENRY, C. B.). 1923. *A manual of dental Anatomy. Human and comparative.* London.

VIRCHOW, R. 1882. *Alttrojanische Gräber und Schädel.* Physikalische Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin. Abh. II, pp. 1-133.

WEIDENREICH, F. 1937. *The dentition of Sinanthropus pekinensis: A comparative odontography of the hominids.* Palaeontologia Sinica, New Series D, No. 1 (Whole Series No. 101), Peiping.

EXPLANATION OF THE FIGURES

[In the explanations of the figures the permanent teeth are shown by capital letters, while the deciduous teeth are indicated by small italic letters. The pictures are not to scale.]

Fig. 1. Tabara. The maxilla of the individual from Level VII. Chalcolithic Age. Right and left I^1, right and left I^2,right and left C^1 (impacted), the socket of right c^1, right P^1, the socket of right P^2, right M^1 and M^2 and the right M^3 (in socket).

Fig. 2. Tabara. The mandible of the individual from Level VII. Chalcolithic Age. Right and left I_1, right and left I_2, right C_1, right P_1, the socket of left P_1, the sockets of right and left P_2, right and left M_1 and M_2.

Fig. 3. Tabara. The mandible of the individual from Level VI. Late Chalcolithic Age. Right I_1 and C_1, sockets of right and left P_1 and P_2, right and left M_1 and M_2. The region of left C_1 and left I_2 and I_1 is broken. A part of the alveolus of right I_1 is preserved.

Fig. 4. Fikirtepe. The maxilla of the individual B. Chalcolithic Age. Right and left I^1 and I^2, left c^1, the socket of right c^1, left P^1 and P^2, right m^1 and m^2, right and left M^1 and right and left M^2 (erupting).

Fig. 5. Fikirtepe. The left side of the maxilla of individual B. Chalcolithic Age. Left I^1, I^2, c^1, P^1, P^2, M^1 and M^2 (erupting).

Fig. 6. Fikirtepe. The mandible of individual B. Chalcolithic Age. Right I_1, the socket of left I_1, sockets of right and left I_2, left c_1, the socket of right c_1, right and left m_1 and m_2, right and left M_1, and right and left M_2 (erupting).

Fig. 7. Troy. The left half of the maxilla of individual No. 1 Tr. Chalcolithic Age (Troy I). Right and left I^1 and I^2, left c^1, left P^1, left m^2, left M^1 and M^2.

Fig. 8. Troy. The left half of the maxilla of individual No. 1 Tr. Chalcolithic Age (Troy I). Right I^1 and left I^1, I^2, c^1, P^1, m^1, M^1 and M^2.

Fig. 9. Troy. The mandible of individual No. 1 Tr. Chalcolithic Age (Troy I). Right and left I_1 and I_2, right and left c_1, left m_1, the socket of right m_1, left m_2, the right P_2 (in socket), right and left M_1 and M_2. The right and left M_3 are still embedded in their sockets.

Fig. 10. Troy. The skull of individual No. 2 Tr. in norma basilaris. Copper Age (Troy II). Right and left I^1, I^2, C^1, P^1, P^2, M^1 and M^2.

Fig. 11. Troy. The mandible of individual No. 2 Tr. Copper Age (Troy II). Right and left I_1, I_2, C_1, P_1, P_2, M_1 and M_2.

Figs. 12-13. Alaca Höyük. Part of the right half of the maxilla of individual No. III. Copper Age. I^2, C^1, P^1, P^2, M^1 and M^2 (erupting).

Figs. 14-15. Alaca Höyük. Part of the left corpus mandibulae of individual No. III. Copper Age. P_1, P_2, M_1 and M_2 (erupting).

Figs. 16. Alaca Höyük. Part of the corpus mandibulae of individual No. III. Copper Age. Right C_1 and P_1.

Fig. 17. Alaca Höyük. The maxilla of individual No. 9. Copper Age. Right and left I^1, left I^2, right C^1, the socket of left C^1, left P^1, the socket of right P^1, right P^2, the socket of left P^2, right and left M^1 and M^2. The right I^2 is congenitally missing.

Figs. 18-19 Kültepe. The left corpus mandibulae and part of ramus mandibulae of individual No. 14 from the house of Adâd-Sululi. Early part of the second millenium B. C. P_1 (erupting), P_2 (erupting), M_1 and M_2. The order of eruption is: M_2, P_2, P_1. In addition there is an isolated left C_1 with a broken root. The tip of this tooth shows an incipient degree of attrition, indicating that it had erupted before the premolars. Bu it is not possible to determine whether C_1 erupted before or after M_2, as the latter also shows an incipient degree of attrition.

Fig. 20. Pazarlı. Left half of the maxilla of individual No. P. XI. Post-Hittite-Phrygian period. m^2 and M^1, and the sockets of I^1, I^2, C^1, P^1 and M^2. P^2 erupts after M^2.

Fig. 21. Pazarlı. The mandible of individual No. P. XI. Post-Hittite-Phrygian period. Sockets of right and left I_1, right and left I_2, left C_1, socket of right C_1, right P_1, socket of left P_1, right and left m_2, right and left M_1 and M_2. The left C_1 is near completing its eruption. It is evident that C_1 erupts after P_1 and M_2 and is followed by P_2.

Fig. 22. Pazarlı. Left half of maxilla of individual No. P. T. VIII. Medo-Persian-Hellenistic period? Sockets of I^1 and I^2, C^1, P^1, m^2, M^1 and M^2 (erupting). It is evident that P^1 and C^1 erupt before M^2, while P^2 appears after M^2.

Fig. 23. Pazarlı. Left half (and a small fraction of the right half) of the mandible of individual No. P. T. VIII. Medo-Persian-Hellenistic period ? Sockets of right and left I_1, socket of left I_2, left C_1 (in socket), socket of left m_1, left m_2, left M_1 and left M_2 (erupting).

Fig. 24. Pazarlı. Left half of the mandible of individual No. P. T. VIII. C_1 (in socket), behind it, the socket of m_1, m_2, M_1 and M_2 (erupting). C_1 is getting ready to erupt. In this mandible C_1, P_1 and P_2 erupt after M_2, but C_1 probably appears before the premolars.

Fig. 25. Alişar Höyük. Right half of the maxilla of individual No. b-x61. Turkish period. I^1, I^2, c^1, m^1, m^2, M^1 and M^2 (erupting).

Fig. 26. Alişar Höyük. Right half of the maxilla of individual No. b-x61. Turkish period. I^2, c^1, m^1, m^2, M^1 and M^2 (erupting). It is evident that in this child the permanent upper canine and premolars erupted later than the upper second permanent molar.

Fig. 27. Karaoğlan. Skiagram of the left lower teeth of individual No. Vi. Post-Hittite-Phrygian? or Medo-Persian-Hellenistic time?. m_2, M_1 and socket of M_2. There is no P_2 under m_2.

Fig. 28. Kumtepe. The skiagram of the left lower teeth of individual No. 2. M_1 and M_2. A silhouette of P_2 is also seen. There is no M_3.