FLUCTUATION OF THE CRANIAL INDEX IN ANATOLIA, FROM THE FOURTH MILLENIUM B. C. TO 1200 B. C.

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In his excellent studies on the skulls from Alişar Höyük, W. M. Krogman [1] discussed the measurements of the skulls and the succession of cranial types from the Chalcolithic Age to the Ottoman period. Subsequently, in a paper published in 1941 I discussed the cranial measurements and the cranial types of the ancient inhabitants of Anatolia from the Chalcolithic to the end of the Hittite period[2]. In a paper published in 1945, Marc-R. Sauter [3] gave the proportions of dolichocephalic, mesocephalic and brachycephalic skulls in the Near East, including Turkey, from ancient to modern times[4]. More recently, Krogman [5] has studied the skulls form the Chalco-

[1] (a) Krogman, W. M. : The cranial types. In E. F. Schmidt's: The Alishar Hüyük, seasons of 1928 and 1929. Part II. OIP Vol. XX, Researches in Anatolia —Vol. V, Chicago, 1933, pp. 122-138; (b) Krogman, W.M. : 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, 1937, pp. 213-293.

[2] Şenyürek, M. S. : Anadolu Bakır çağı ve Eti sekenesinin Kraniyolojik tetkiki (A craniological study of the Copper Age and Hittite populations of Anatolia). *Belleten*, Vol. V, No. 19, 1941, pp. 219-235 and 237-253.

[3] Sauter, Marc-R. : Les races brachycéphales du Proche-Orient, des origines à nos jours. Archives Suisses d'Anthropologie Générale. Vol. XI, No. 1, 1945, pp. 68-131.

[4] It should be noted here that C. U. A. Kappers also has discussed the cephalic index in ancient and recent peoples of the Near East. See Kappers, C. U. A. : An introduction to the anthropology of the Near East in ancient and recent times. Amsterdam, 1934 (With a chapter on Near Eastern Blood groups by L. W. Parr).

[5] Krogman, W. M. : 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 (July), 1949, pp. 407-477.

lithic to Byzantine times from Chatal Höyük and Tell Al-Judaidah and Angel [6] in his exhaustive monograph has discussed the cranial types from Troy and its vicinity, from Troy I (Chalcolithic Age) to the late Roman period. But in the studies that have been made so far, although the means of the skulls from various sites have been calculated, so far as I know the mean values of the cranial measurements and indices of all the available ancient Anatolian skulls from the various sites belonging to the same period have not been given. In order to meet this need, at least partially, I have decided to calculate the averages of the glabello-occipital length, maximum skull breadth and of the cranial index of the skulls of the ancient inhabitants of Anatolia, belonging to the Chalcolithic, Copper Age, Early Bronze Age and the Hittite Empires period. Although the series from these periods, especially from the Early Bronze Age, are still not as large as one would wish, they are still much larger than the series from the same periods, when I studied them in 1941, thus giving more reliable results for at least some of the periods.

It is known that the cranial index by itself is not sufficient to separate individuals belonging to widely different major races such as the Whites and Mongoloids[7]. But within the same primary race, such as, for example, the ancient inhabitants of the Near East, belonging to the white race, the cranial index is sufficient to separate the Alpine and the plano-occipital Western Asiatic brachycephals on the one hand and the longheaded Mediterraneans and Eurafricans on the other. However, I would like to point out here that many of these ancient Anatolian skulls and their morphology have already been studied by various investigators and that in a large number of the cases their cranial types have been determined. Thus by supplementing the evidence of length, breadth and that of the cranial index by our knowledge of their other features not only can the fluctuation of the cranial index be discussed in the ancient inhabitants of Anatolia at various periods but also the succession of cranial types.

The skulls studied belong to Chalcolithic, Copper Age, Early Bronze Age and the Hittite Empires period, that is, they range in

[6] Angel, J. L. : Troy. The human remains. Supplementary monograph 1. Princeton University Press for University of Cincinnati, 1951.

[7] See Hooton, E. A. : Up from the Ape. New York, 1946, p. 502.

time from the fourth millenium B.C. to about 1200 B.C.[8] The material studied by me, that is, the skulls preserved in the Department of Anthropology of the University of Ankara, is listed in Table 1. Among these, the skulls from Ahlatlıbel [9], Babaköy [10], Karaoğlan [11], Kusura [12] and from Kaledoruğu and Tekeköy [13] have already been studied by various writers. But I have remeasured and restudied the skulls studied by other writers during the preparation of this work. A brachycephalic skull from Kumtepe had originally been studied by Kansu [14]. Subsequently, in addition to this skull, I described [15] three more dolichocephalic and mesocephalic skulls from this site which, although found at the same time as the brachycep-

[8] For the duration of these periods and for the correlation of different levels of various sites see: Özgüç, T. Öntarihte Anadolu Kronolojisi. *Belleten*, Vol. IX, No. 35, 1945, pp. 341-360.

[9] Kansu, Ş. A. : Les ossements d'Ahlatlıbel (Âge du Cuivre). *Türk Antropoloji Mecmuası (Revue Turque d'Anthropologie)*, No. 19-22, 1939, pp. 22-35.

[10] Kökten, İ. K. : 1949 yılı tarih öncesi araştırmaları hakkında kısa rapor (Recherches de prehistoire faites en 1949—Summary). *Belleten*, Vol. XIII, No. 52, 1949, pp. 813 and 830.

[11] Kansu, Ş. A. and Tunakan, S. : Karaoğlan höyüğünden çıkarılan Eti, Frik ve Klâsik devir iskeletlerinin antropolojik incelenmesi (Etude anthropologique des squelettes datant des époques Hittite et Phrygienne et de l'Âge classique, provenant des fouilles du Höyük de Karaoğlan, 1937-1938). *Belleten*, Vol. XII, No. 48, pp. 759-774 and 775-778.

[12] Kansu, Ş. A. and Atasayan, M. : Afyonkarahisar Kusura hafriyatında meydana çıkarılan Bakırçağı ve Eti devirlerine ait iskeletler üzerine tetkikler (Recherches sur les squelettes de l'Âge du Cuivre et de l'époque Hittite, decouverts dans les fouilles de Kusura, aux environs d'Afyonkarahisar). *Türk Antropoloji Mecmuası (Revue Turque d'Anthropologie)*, No. 19-22, 1939, pp. 272-289.

[13] (a) Kökten, K., Özgüç, N. and Özgüç, T.: 1940 ve 1941 yılında Türk Tarih Kurumu adına yapılan Samsun bölgesi kazıları hakkında ilk kısa rapor. *Belleten*, Vol. IX, No. 35, 1945, pp. 361-400; (b) Şenyürek, M. S. : Two cases of premature suture closure among the ancient inhabitants of Anatolia. *Belleten*. Vol. XV, No. 58, 1951, pp. 247-262.

[14] Kansu, Ş. A. : Kumtepe neolitik Kemikleri üzerinde antropolojik tetkik. Etude anthropologique sur les ossements de Kumtepe (Troad). Belleten, No. 2, 1937, pp. 557-569 and 570-582.

[15] Şenyürek, M. S. : 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, 1949, pp. 295-299 and 300-304.

halic skull, had not been described by Kansu. A portion of the skulls from Alaca Höyük have already been studied by Kansu [16] and by Kansu and Tunakan[17]. I have remeasured and restudied the skulls already examined by these writers. The crania from Dündartepe [18], Tilkitepe [19], Büyük Güllücek [20], Maşat Höyük [21], Polatlı [22], and a portion of the skulls from Alaca Höyük [23] have already been studied by me. The skulls from Şeyh Höyük have been studied by me and Tunakan [24]. The skeletons from Yümüktepe (Mersin) and Kültepe,

[16] Kansu, Ş. A. : Etude anthropologique de quelques squelettes d'Alacahöyük *L'Anthropologie*, Vol. 47, Nos. 1-2, 1937, pp. 35-39.

[17] (a) Kansu, Ş. A. and Tunakan, S. : Türk Tarih Kurumu Alaca-Höyük kazılarında (1936—1944) Bakırçağı yerleşme katlarından çıkarılan iskeletlerin antropolojik incelenmesi. *Belleten*, Vol. IX, No. 36, 1945, pp. 411-422; (b) Kansu, Ş. A. and Tunakan, S. : Alaca-Höyük 1943—1945 kazılarından çıkarılan Kalkolitik, Bakır ve Tunç çağlarına ait halkın antropolojisi (Sur l'Anthropologie de la populations des Âges Chalcolithique, du Cuivre et du Bronze mis au jour lors des fouilles d'Alacahöyük, 1943—1945). *Belleten*, Vol. X, No. 40, pp. 539-555; (c) Tunakan, S. : Türk Tarih Krumu Alaca-Höyük kazılarında şimdiye kadar çıkarılan iskeletler üzerinde yapılan incelemelerin bibliografyası. *Belleten*, Vol. XIII, No. 50, 1949, p. 339.

[18] Şenyürek, M. S. : op. cit., 1941.

[19] Ibid.

[20] Şenyürek, M. S.: Büyük Güllücek'de bulunan Kalkolitik çağa ait bir muharibin iskeletinin tetkiki (Study of the skeleton of a Chalcolithic Age warrior from Büyük Güllücek). *Ankara Üniversitesi Dil ve Tarih Coğrafya Fakültesi Dergisi (Revue de la Faculté de Langue, d'Histoire et de Géographie, Université d'Ankara)*, Vol. VIII, No. 3, 1950, pp. 269-289 and 290-310.

[21] Şenyürek, M. S. : 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, 1946, pp. 231-254.

[22] Şenyürek, M. S. : A study of human skulls from Polatlı Hüyük. *Anatolian Studies*, Vol. I, 1951, pp. 63-71.

[23] (a) Şenyürek, M. S. : op. cit., 1941; (b) Şenyürek, M. S. : Alaca Höyük'de bulunan üç kafatasına dair bir not (A note on three skulls from Alaca Höyük). *Belleten*, Vol. XIV, No. 53, 1950, pp. 57-84; (c) Şenyürek, M. S. : Two cases of premature suture closure among the ancient inhabitants of Anatolia. *Belleten*, Vol. XV, No. 58, 1951, pp. 247-262; (d) Şenyürek, M. S. : 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, No. 1-2, 1951, pp. 43-61.

[24] Şenyürek, M. S. and Tunakan, S. : Şeyh Höyük iskeletleri (The skeletons from Şeyh Höyük). *Belleten*, Vol. XV, No. 60, 1951, pp. 431-445 (This issue of *Belleten*).

from the excavation season of 1948 conducted by T. Özgüç [25], are still unpublished. But my studies on these skeletons are almost finished and they will be published in *Belleten*.

The material that has been compiled from the literature is listed in Table 2. As only a portion of the skulls from Alişar Höyük are preserved in the Department of Anthropology of the University of Ankara, the measurements of all of these skulls have been directly taken from Krogman [26]. I have also taken the measurements of the crania from Chatal Höyük and Tell Al-Judaidah from the report of Krogman [27]. The measurements and indices of the skulls from Troy have been taken from Virchow [28] and Angel [29], those of the skull from Hanai Tepe (B) from Virchow [30] and of that from Yortan Kelembo from Houzé [31]. The measurements of a skull from Babaköy are taken from Angel [32] and of those from Gözlükule (Tarsus) from Ehrich [33] and of that from Boz Höyük from Virchow [34]. Now the skulls from the various periods mentioned can be studied.

THE CHALCOLITHIC SKULLS

From Table 3 it is seen that the cranial index of the Chalcolithic skulls varies from 65.07? to 82.32, with a dolichocephalic average

[25] Özgüç, T. : Türk Tarih Kurumu tarafından yapılan Kültepe kazısı raporu, 1948 (Ausgrabungen in Kültepe. Bericht über die im Auftrage der Türkischen Historischen Gesellschaft, 1948. Durchgeführten Ausgrabungen). Ankara, 1950.

[26] Krogman, W. M. : op. cit., 1937.

[27] Krogman, W. M. : op. cit., 1949.

[28] Virchow, R. : Alttrojanische Gräber und Schädel. Physikalische Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin. Abh. II, 1882, pp. 1-133.

[29] Angel, J. L. : op. cit., 1951.

[30] Virchow, R. : op. cit., 1882.

[31] Houzé, M. : Les ossements humains d'Yortan Kelembo. *Bulletin de la Société d'Anthropologie de Bruxelles*. Vol. XXI, 1903, pp. cvi-cxvi.

[32] Angel, J. L. : The Babaköy skeleton. *Archiv für Orientforschung.*, Vol. XIII, Heft 1/2, 1939, pp. 28-32.

[33] Ehrich, R. W. : Preliminary notes on Tarsus crania. *American Journal of Archaeology*, Vol. XLIV, No. 1, 1940, pp. 87-92.

[34] Virchow, R. : Funde aus dem nordwestlichen Phrygien und von Salonik. Verhandlungen der Berliner Gesellschaft für Antrhopologie, Ethnologie und Urgeschichte, 1896, pp. 123-126.

for both males and females [35]. The average cranial index of the combined adult males and females is 73.0, that is dolichocephalic. If the crania of 8 children are added to those of the adults, the average is 73.65, that is still dolichocephalic.

It is noticed that in the available Chalcolithic series the average cranial index of the females (72.91) is lower than that of the males (73.08). This is due to the presence of three deformed female crania from Şeyh Höyük, which have lower cranial indices than the males from this site [36]. The lower cranial index of the females from this site is, as has been pointed out, probably due to the artificial deformation which is more apparent in the females [37]. If the three deformed female crania from Şeyh Höyük are left out of consideration, the average cranial index of 7 Chalcolithic females is 75.44, which is higher than that of the males. It is seen that in the available Chalcolithic series, in length, breadth and in the cranial index the females are more variable than the males.

Table 4 shows the distribution of the Chalcolithic skulls according to Garson's [38] classification of the cranial index. From this table it is seen that 74.99% of the males, 60% of the females and 68.17% of the combined male and female crania are dolichocephalic. On the other hand, only 8.33% of the males, 10.00% of the females and 9.09% of the combined male and female skulls are brachycephalic. In the present Chalcolithic series there are no ultradolichocephalic specimens, but this is probably due to the smallness of the series. It is also noted that there are no hyperbrachycephalic or ultrabrachycephalic individuals.

In the combined series, including the children (Table 5), 63.32% of the crania are dolichocephalic and only 10.00% are brachycephalic. Again there are no ultradolichocephalic, hyperbrachycephalic or ultrabrachycephalic specimens.

In short, the greatest part of the 30 Chalcolithic skulls studied are dolichocephalic, there being only three brachycephalic specimens

[35] It may be noted here that among the females the minimum value of the cranial index (65.07?) is found in a skull from Şeyh Höyük (No. 4) and the minimum value for the males (66.49) is in a skull from Yümüktepe (Level XVIII - XIX).

[36] Şenyürek, M. S. and Tunakan, S. : op. cit., 1951, pp. 432 and 440.

[37] Ibid., pp. 433 - 434 and 441.

[38] See Martin, R. : Lehrbuch der Anthropologie, Jena, 1928, pp. 648-649.

amongst them. One of these brachycephalic individuals is from Tilkitepe [39], one from Kumtepe [40] and one from Troy I (No. 1 tr)[41]. In this connection, the situation found at Kumtepe is of interest. As I showed in a previous study [42], in the Chalcolithic period of Kumtepe dolichocephals had clearly preceded the arrival of the brachycephals, a brachycephalic skull appearing only in Kumtepe level Ic, which represents the last phase of the Chalcolithic period at this site [43].

THE COPPER AGE SKULLS

The average of the 33 adult male skulls (74.43) is dolichocephalic, while that of 18 females (75.48) is weakly mesocephalic. The average of the combined male and female skulls is also dolichocephalic (74.80). When the 13 children's skulls are added to those of the adults the combined average is (75.30), that is slightly mesocephalic. The variability of the length and breadth measurements are quite near in the two sexes, although the length is slightly more variable in the males, while the reverse is the case in the breadth. In the cranial index the female Copper Age skulls are more variable than the males (Table 6).

The distribution of cranial indices according to Garson's classification of the cranial index are shown in Tables 7 and 8. From Table 7 it is seen that 60.60% of the males, 44.43% of the females and 54.89% of the combined male and female skulls are dolichocephalic. On the other hand, only 12.12% of the males, 16.66% of the females and 13.72% of the combined males and females are brachycephalic. Only one skull is ultradolichocephalic, and there are no hyperbrachycephalic and ultrabrachycephalic specimens among the adults. In the combined series of children and adults (Table 8),53.12 % of the skulls are dolichocephalic and 15.62% are brachycephalic. Only two children's skulls are hyperbrachycephalic.

[39] Şenyürek, M. S. : op. cit., 1941, pp. 226 and 243 and Table IV.

[40] Kansu, Ş.A.: *Belleten*, No.2, 1937; Şenyürek, M. S.: op. cit., 1949, pp.297-298 and 302-303.

[41] Angel, J. L. : op. cit., 1951, p. 5.

[42] Şenyürek, M. S. : op. cit., 1949, pp. 299 and 303-304.

[43] Ibid, pp. 295, 299, 300 and 304.

One of these is from Alaca Höyük (No. VIII, cranial index 86.95) [44] which is that of an approximately six years old child, and the second one is from Troy II (No. 5 tr., cranial index 86.34), who is eight years old.[45] As two children of respectively 6 and 8 years of age are being dealt with here, it is perhaps not unreasonable to suppose that if they had grown to maturity the cranial index would probably fall into the merely brachycephalic category.

A comparison of Tables 3 and 6 shows that the Copper Age skulls are, on the average, shorter and slightly broader than the Chalcolithic skulls. Consequently the average cranial index of the Copper Age skulls is somewhat higher than that of the Chalcolithic crania. Is this a significant difference, indicating a change in the basic, native population in the Copper Age of Anatolia? The differences between the means of the measurements and cranial indices of the Chalcolithic and Copper Age skulls, and the probable errors of the differences between the means of the two periods are listed in Table 9. From this table it is seen that the differences between the length, breadth and cranial indices of the Chalcolithic and Copper Age skulls are smaller than three times their probable errors. In other words, the differences between the Chalcolithic and Copper Age Anatolian skulls are not significant. Thus, the native Copper Age population of Anatolia appears to be a continuation of the Chalcolithic population. [46]

However, as I stated above, it is still a fact that the Copper Age skulls tend to have a shorter length, a slightly larger breadth and a somewhat higher cranial index than the Chalcolithic skulls, although these differences are not significant statistically. This situation is probably due to a wave of predominantly brachycephalic invaders that appear to have come to Anatolia in the Copper Age, which will be presently discussed.

[44] Şenyürek, M. S. : Alaca Höyük'de bulunan üç kafatasına dair bir not (A note on three skulls from Alaca Höyük). *Belleten*, Vol. XIV, No. 53, 1950, pp. 57-58 and 71-72.

[45] Angel, J. L. : op. cit., 1951, pp. 7-8.

[46] (a) von der Osten, H. H.: op. cit., 1937, p. 426 ; (b) Şenyürek, M. S.: op. cit., 1941, pp. 227 and 244-245; (c) Şenyürek, M. S. : En eski Anadolu halkının kraniyolojik tetkiki. III. Türk Tarih Kongresi, Ankara, 15-20 Kasım 1943. Türk Tarih Kurumu yayınlarından, IX. Seri - No. 3, Ankara, 1948, p. 206.

This is indicated by the study of the skulls from Alaca Höyük. The length and breadth measurements and the cranial indices of the Chalcolithic and Copper Age skulls from Alaca Höyük are shown in Table 10. From this table it is seen that there are no brachycephalic skulls in the available Chalcolithic series from Alaca Höyük[47]. On the other hand, out of the eleven, Copper Age skulls, including the children, five are brachycephalic[48]. Indeed, the percentage of brachycephalic skulls in the Copper Age stratum of Alaca Höyük (45.45 %) is much higher than that of the total Anatolian Copper Age series.

It is thus seen that the earlier inhabitants of Alaca Höyük were longheaded and that the brachycephals came in later, at about the middle of the Copper Age. In my study of 1941 I had explained the presence of dolichocephals and brachycephals among the crania from Alaca Höyük in the following way: "*These dolichocephalic and mesocephalic skulls resemble the Copper Age skulls found in other Anatolian sites (Table III). Thus they appear to belong to the native copper age population of Anatolia, while the brachycephalic skulls from this site probably represent the aristocrats and the invaders.*"[49] This new study on the larger Alaca Höyük series further supports this conclusion. [50]

Dr. Sedat Alp, Professor of Hittitology of the University of Ankara, commenting on the occurrence of *lituus* in K grave at Alaca Höyük has concluded: "*These finds are very important as they indicate that the graves at Alaca are royal graves, since among the Hittites, probably*

[47] A skull from the Chalcolithic layer of Büyük Güllücek, which is near Alaca Höyük, is also dolichocephalic. See Şenyürek, M. S. : Büyük Güllücek'de bulunan Kalkolitik çağa ait bir muharibin iskeletinin tetkiki (Study of the skeleton of a Chalcolithic Age warrior from Büyük Güllücek). *Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi (Revue de la Faculté de Langue, d'Histoire et de Géographie, Université d'Ankara)*, Vol. VIII, No. 3, 1950, pp. 269-289 and 290-310.

[48] The same situation is also found at Kusura, where one skull (No. grave 2.8) from the Chalcolithic period is dolichocephalic (cranial index 73.93), whereas of the two skulls from the Copper Age stratum, one (No. V. 94.26) is brachycephalic (cranial index 80.58) and the other (No. V. SWC. 94. A), which is that of a child, is dolichocephalic (cranial index 70.71).

[49] Şenyürek, M. S. : op. cit., 1941, p. 240.

[50] It should be mentioned here that a suggestion to this effect was made earlier by the archaeologist von der Osten. See von der Osten, H. H. : op. cit., 1937, p. 426.

following an old Anatolian tradition, only the kings used this important insigne."[51] Dr. Tahsin Özgüç, in his study of the protohistoric burial customs in Anatolia, published in 1948, has stated: "*Die Kammergräber von Alacahöyük gehören einer Anatolien fremden, von aussen her gekommenen Herrscherschicht an. Die Kultur dieser Kammergräberbauer ist einerseits der einheimischen anatolischen Kultur zugehörig, andererseits aber einer fremden, die sonst in dieser Gegend nicht belegt ist und deren Verwandte bisher noch nicht gefunden sind.*"[52] Thus we see that there is also some archaeological evidence indicating that the roundheaded crania from Alaca Höyük probably represent the aristocrats and the invaders.

It is well known that some writers [53] had formerly assumed that the earlier populations of Anatolia were roundheaded. Kansu, in his study on the Seljuk skeletons, had gone so far as to state[54]: "*The Oghuz-Seljuk Turks have not completely changed the racial physiognomy of Anatolia as has been claimed. For, from the study of anthropological and archaeological documents it is understood that this country, all the way from Eastern*

[51] Alp, S. : Hitit metinlerinde Gişkalmuş "Lituus" ve Hub.bı "Küpe". (GişKalmuş "*Lituus*" and Hub.bı "earring" in the Hittite texts). *Belleten*, Vol. XII, No. 46, 1948, p. 323.

[52] Özgüç, T. : Die Bestattungsbraeuche im vorgeschichtlichen Anatolien. Veroeffentlichungen der Universitaet von Ankara, 14. Wissenschaftliche Reiche: 5. Ankara, 1948, p. 150.

[53] (a) von Luschan, F. : The early inhabitants of Western Asia. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland*, Vol. XLI, 1911, pp. 221-244; (b) Fischer, E. "Spezielle Anthropologie: Rassenlehre", Anthropologie, unter Leitung von G. Schwalbe und E. Fischer "Die Kultur der Gegenwart" Hrsg. Von F. Hinneberg, 3 Teil, 5 Abt. Leipzig and Berlin. 1923 (Not available to the writer. Cited by Krogman, op. cit., 1937, p. 279); (c) Kansu, Ş. A. : Selçuk Türkleri hakkında antropolojik ilk bir tetkik ve neticeleri. İkinci Türk Tarih Kongresi, İstanbul, 20-25 Eylül, 1937. Türk Tarih Kurumu yayınlarından, IX. Seri, No. 2, İstanbul 1943, pp. 443-444 and 456. Translation: "Kansu, Ş. A. : A first anthropological study on the Seljuk Turks and its results. Second Turkish Historical Congress, İstanbul, September 20-25, 1937. Publications of the Turkish Historical Society, Series IX, No. 2, İstanbul, 1943, pp. 443-444 and 456."

[54] Kansu, Ş. A. : op. cit., 1943, p. 456. This passage of Kansu has been translated into English by me. Kansu's Turkish text is as follows: "*Oğuz-Selçuk Türkleri Anadolu'yu istilâ etmekle, iddia edildiği gibi, Anadolu'nun ırkî simasını tamamen değiştirmiş değildirler. Çünkü Selçuk Türkleri Anadolu'ya geldikleri vakit bu toprakların şarkî Anadolu'dan ta Ege kıyılarına kadar büyük bir ekseriyeti Alpli yani Proto-Türk olan beşer unsurları tarafından Protohistuvar'danberi meskûn olduğu, bir taraftan antropolojik, diğer taraftan arkeolojik vesikaların tetkiki ile anlaşılmaktadır.*"

Anatolia to the Aegean shores, had been occupied since Protohistoric times by human elements, the majority of which were Alpine, that is Proto-Turks."[55] However, Dr. Krogman in his excellent study on the crania from Alişar Höyük, clearly showed that at Alişar the Mediterranean dolichocephals had antedated the brachycephals[56]. Subsequently, in a study I published in 1941 [57], based upon a larger series of skeletons coming from various parts of Anatolia, I was able to show that the majority of the Chalcolithic and Copper Age inhabitants of Anatolia were dolichocephals of Mediterranean and Eurafrican types and that the brachycephals, which were of the Alpine type, were in the minority in these periods.[58] This new study on a still larger

[55] In his first study on the two brachycephalic skulls from Alaca Höyük found in the season of 1935, Kansu (see *L'Anthropologie*, Vol. 47, Nos. 1-2, 1937, p. 39) had concluded: "*La prédominance des éléments brachycéphales dans la paléoethnologie du sol anatolien est ainsi confirmée par ces nouvelles recherches: anthropologie et archéologie sont nettement d'accord sur ce point.*"

[56] (a) Krogman, W. M. : op. cit., 1937; (b) Coon, C. S. : The races of Europe. New York, 1939, pp. 136-137; (c) Vallois, H. V. : Les ossements humains de Sialk. Contribution à l'étude de l'histoire raciale de l'Iran ancien. In R. Ghirshman: Fouilles de Sialk, près de Kashan, Vol. II. Musée du Louvre-Département des Antiquités Orientales. Série Archéologique. Vol. V, 1939, pp. 181 and 191-192.

It may be noted here that in his study of 1933 Krogman had already indicated that the dolichocephals had preceded the brachycephals at Alişar Höyük (see Krogman, W. M. : op. cit., 1933, p. 131).

For a discussion of the history of contributions made to the physical anthropology of the ancient inhabitants of Anatolia see Şenyürek, M. S. : 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, No. 1-2, 1951, pp. 52-55.

[57] Şenyürek, M. S. : op. cit., 1941.

[58] In this connection it should be mentioned that Angel (op. cit., 1951, pp. 7-8) has attributed a skull from Troy II (No. 5 tr.) to the "Eastern Alpine" type, which he considers as the eastern subtype of the Alpines (Angel, op. cit., 1951, pp. 25-26). For this subtype Angel (op. cit., 1951, p. 26) states: "*This has a boxlike, high head with short and often flattened occiput, and a face of medium height, orthognathous, with relatively narrow nose, rhomboid and sloping orbits, and shallow lower face with projecting chin. Gonial angles are square in profile, but narrow enough in front view to suggest the Dinaric tendency.*" In this connection a brachycephalic skull from the Copper Age stratum of Alaca Höyük (No. XX) is of interest. Unfortunately, of this skull only the top of the calva is preserved. This calva shows a rather extensive lambdoid flattening, thus suggesting the Eastern Alpine type. However, although the height cannot be measured, this calva appears to be low in height, thus differing from

series further affirms that the earliest known inhabitants of Anatolia were predominantly longheaded. [59]

THE EARLY BRONZE AGE SKULLS

There are unfortunatley only four skulls from the Early Bronze Age, of which three are from Alişar Höyük [60] and one from Alaca Höyük.[61] Of the skulls from Alişar Höyük, one is dolichocephalic, one (a juvenile specimen) is mesocephalic and the third one is brachycephalic (Table 11). The skull from Alaca Höyük is very long (227 mm.), but as the skull is broken its breadth cannot be measured. However, this skull appears to be longheaded.[62]

Out of the four Early Bronze Age skulls one is brachycephalic (25.00%). It is not at all unlikely, but by no means certain, that the Early Bronze Age population was the same as the succeeding Hittite population.[63] But because of the lack of a large series it is difficult to make a definite statement on this point.

ANATOLIAN SKULLS FROM 2000-1200 B. C. (HITTITE PERIOD)

The first serious study on the authentic skulls from the Hittite period was made by Krogman [64] who described the skulls from Alişar Höyük [65]. In his excellent study of 1937, Dr. Krogman states:

the Eastern Alpine subtype as defined by Angel. As the face is completely missing it cannot be determined with certainty whether this calva belongs to the Eastern Alpine or the classical Alpine subtype.

[59] For a survey of the ancient inhabitants of other Near Eastern countries see (a) Krogman, W. M. : op. cit., 1937; (b) Vallois, H. V. : op. cit., 1939; (c) Krogman, W. M. : The peoples of early Iran and their ethnic affiliations. *American Journal of Physical Anthropology*, Vol. XXVI, 1940, pp. 269-308; (d) Şenyürek, M. S. : op. cit., 1941; (e) Sauter, Marc-R. : op. cit., 1945.

[60] Krogman, W. M. : op. cit., 1933 and op. cit., 1937.

[61] First studied by Kansu, Ş. A. and Tunakan, S. : op. cit., 1946, pp. 547-548.

[62] Ibid., p. 549.

[63] See (a) Krogman, W. M. : op. cit., 1933, pp. 130-131; (b) Krogman, W. M. : op. cit., 1937, pp. 225 and 274; (c) Şenyürek, M. S. : op. cit., 1941, pp. 227 and 245.

[64] Krogman, W. M. : op. cit., 1937.

[65] It may be noted here that Kansu in two studies published in 1930 and 1934 also stu lied 20 skulls (ten in each study) from Alişar Höyük, under the heading of Hittites. Although in his first study (1930, p. 26) Kansu made the reservation that "*En tout cas, je ne prétends pas catégoriquement que tous ces restes squelétiques,*

"... *Alişar Copper Age and Phrygian present a longheaded type, Alişar Early Bronze Age and Hittite Empires a roundheaded type.*" [66] Subsequently, on an only slightly larger series, I concluded: "*The evidence indicates that about 2000 B.C. a new invasion took place in Anatolia. This was made by the Hittites who were predominantly of alpine stock. The craniological evidence, however, suggests that the Hittite invaders did not annihilate the native population they found in Anatolia, but on the contrary mixed with them and tried to assimilate them.*" [67]

The length and breadth measurements and the cranial indices of the available skulls from the various parts of Anatolia dating from 2000-1200 B.C. are listed in Table 12. From this table it is seen that the average of the males (77.37) is mesocephalic, that of the females (81.08) is brachycephalic and that of the combined male and female

mis aujourd'hui à jour dans le Huyük d'Alişar, appartiennent sans exception, à la vraie période Hétéenne, mais tout de même je pense que grâce à ces matériaux nous pourrons faire l'ébauche d'une étude qui est déjà considérablement importante au point de vue anthropologique et historique.", in his second study he merely stated (1934, p. 105) "*Les matières craniologiques sont de la même provenance et des mêmes fouilles faites sous la direction de H. H. von der Osten dans le Hüyük d'Alişar*" and described them under the heading of Hittites. In this second study Kansu (1934, p. 105) merely concluded: "*Dans mes premières recherches sur la craniologie des Hittites j'avais insisté sur la prédominence des éléments brachymorphes. Or l'examen de cette nouvelle série confirme ma précédente observation.*"

However, a comparison of the individual numbers with those of Krogman (Krogman, op. cit., 1937), shows that most of the skulls studied by Kansu do not belong to the Hittite Empires period. Out of the 20 skulls of Kansu only five (Nos. bx 44, bx 43, bx 32, bx 35, and dx 32) belong to the Hittite period. All of these five skulls belonging to the Hittite period are brachycephalic. As for the remaining skulls studied by Kansu, one belongs to the Copper Age, one to the Hellenistic period, 6 to the Roman period and 6 to the Turkish period, and one is without a number. See (Kansu), Şevket Aziz: Hittite'lerin kraniolojik tetkikatına methal (Sur la morphologie des crânes trouvés dans un Hüyük (Tell) d'Anatolie-Alişar. *Türk Antropoloji Mecmuası* (*Revue Turque d'Anthropologie*), No. 10, 1930, pp. 3-17 and 25-30; (Kansu), Şevket Aziz: Deuxième contribution à l'étude craniologique des Etis (Hittites). *Türk Antropoloji Mecmuası* (*Revue Turque d'Anthropologie*), No. 15-16, 1934, pp. 105-109.

Subsequently, however, in his study of Seljuk crania, Kansu (Kansu, op. cit., 1943, p. 456) gave the average cranial index (81.32) of only 6 skulls from Alişar Höyük as Hittites. In this connection also see Vallois, H. V. : Garbî Asyanın ırklar tarihi. İkinci Türk Tarih Kongresi, İstanbul, 20-25 Eylül 1937. Türk Tarih Kurumu Yayınlarından IX. Seri : No.2, İstanbul, 1943, pp. 473-477.

[66] Krogman, W. M. : op. cit., 1937, p. 216.

[67] Şenyürek, M. S. : op. cit., 1941, p. 245.

skulls (78.75) is again mesocephalic. When the two children are added, the average of the combined series is 78.81, that is again mesocephalic. Thus the skulls from 2000-1200 B.C. differ from those of the Copper Age (Table 6), in having a higher average cranial index. The males are more variable than the females in length, but the opposite is the case in breadth and in the cranial index (Table 12).

The distribution of the skulls according to Garson's[68] classification are listed in Tables 13 and 14. It is seen that, as compared with the Copper Age series (Table 7 and 8), the percentages of the dolichocephals is less in the series from 2000-1200 B.C., whereas that of the brachycephals is considerably higher. Among the Anatolian skulls from 2000-1200 B.C., 27.26% of the males, 46.14% of the females and 34.27 % of the combined males and females are brachycephalic. When the two children's skulls are added to the series, 35.13% of the individuals are brachycephalic.

From the account given it is clear that in the Hittite Empires times, in the sites studied, the proportion of the brachycephals had tremendously increased. Indeed, even at sites where no brachycephals are observed in the Copper Age, brachycephals are now found. For instance, in Alişar Höyük, where no brachycephalic skulls have been found in the Copper Age, a large percentage of brachycephals were found in the Hittite period.[69]

I have divided the series from 2000-1200 B.C. into the Central and Peripheral Anatolian groups, as it is known that, although the Hittites had at various times formed an empire covering most of Anatolia and even including Syria, they were especially centered in Central Anatolia, where they were the strongest. The central Anatolian group, which is from the known Hittite Area, includes skulls from Alişar Höyük, Boz Höyük[70], Karaoğlan, Kusura and Polatlı. The Peripheral Anatolian group includes crania from Chatal Höyük and Tell Al-Judaidah, Kültepe, Tarsus and Troy. The reason for

[68] Martin, R. : op. cit., 1928, pp. 648-649.

[69] See Krogman, W. M. : op. cit., 1937; von der Osten, H. H. : op. cit., 1937, p. 445; Şenyürek, M. S. : op. cit., 1941, pp. 227 and 245.

[70] For the date of this skull Krogman (Krogman, op. cit., 1937, p. 271) states: "*Since iron slag, evidence of a knowledge of smelting iron ore, was found in the mound (ibid., p. 19 f), the date will be little if at all before 1500 B.C.*". But as is stated by Angel, the exact age is not known (see Angel, op. cit., 1951, p. 12).

including Kültepe, a site in central Anatolia, in the peripheral Anatolian group is that this was the site of a trading colony established by Assyrian merchants at the beginning of the 2 nd millenium B.C.[71]

The figures thus obtained are listed in Tables 15-20. From a comparison of Tables 15 and 16, it is seen that the skulls from Central Anatolia differ from the Peripheral Anatolian group in having a smaller length, larger breadth and a much higher cranial index. Tables 17-20 also show that the central Anatolian group has a smaller percentage of dolichocephals and a higher percentage of brachycephals than the Peripheral Anatolian group. In the Central Anatolian group 42.84% of the males, 66.66% of the available females and 47.05% of both sexes are brachycephalic. On the other hand, in the Peripheral group there are no brachycephals among the available male skulls, whereas 40.00% of the females are brachycephalic.

This comparison further demonstrates that a large percentage of the Hittites proper, represented by the central Anatolian group, were brachycephalic. On the other hand, we have noted that in the peripheral Anatolian group there is a conspicuous difference between the sexes in regard to the cranial index; the females showing a large percentage of brachycephals. The meaning of this sexual dichotomy in the peripheral Anatolian group will be further discussed in a later page.

The differences between the measurements and cranial indices of the skulls from the Copper Age and from 2000-1200 B.C. and the probable errors of these differences are shown in Table 21. It is seen that, with the only exception of the glabello-occipital length of the males, in all the other cases listed the differences between the measurements and cranial indices are greater than three times their probable errors. That is, in most cases the differences between the skulls of these two periods are statistically significant.

In Tables 22 and 23 the Copper Age skulls are compared with those from the Central and Peripheral Anatolian groups dating from 2000-1200 B.C. From Table 22 it is seen that the differences between

[71] For the chronology of this site see Bilgiç, E. : Anadolu'nun ilk tarihî çağının ana hatlarile rekonstrüksiyonu. *Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi (Revue de la Faculté de Langue, d'Histoire et de Géographie,, Université d'Ankara)*,, Vol. VI, No. 5, 1948, pp. 496-500; Özgüç, T. : op. cit., 1950, pp. 94-103 and 210-221.

the length and breadth measurements and cranial indices of the skulls belonging to the Copper Age and to the Central Anatolian group of 2000-1200 B.C., are in all cases, including the length of the males, more than three times their probable errors, that is these differences are significant.

As for the differences between the Copper Age skulls and the Peripheral Anatolian group of skulls from 2000-1200 B.C., the differences are significant only in the glabello-occipital length of the males and in the breadth and cranial indices of the females and combined males and females (see Table 23).

It has already been noted that the skulls from 2000-1200 B.C. differ significanly in most cases from the Copper Age population. However, when the crania from 2000-1200 B.C. are divided into two groups, it is found that it is especially the Central Anatolian group which, in the case of both the males and females, differs significantly from the Copper Age skulls in length, breadth and in the cranial index. Thus it appears that it is this central Anatolian group that represents the predominantly brachycephalic Hittite invaders.

It was stated above that the males of the Peripheral Anatolian group from 2000-1200 B.C. differed from the Copper Age skulls significantly only in length. This is at least partly due to the presence of four big-headed Assyrian colonists from Kültepe in this Peripheral group. Further, it was noted before that there was a conspicuous difference in the average cranial index of the males and females of the Peripheral Anatolian group. This divergence of the females from the males in the Peripheral group can now be studied.

The differences between the measurements and cranial indices of the Central and Peripheral Anatolian groups of 2000-1200 B.C. and the probable errors of these differences are listed in Table 24. From this table it is seen that the males of the Peripheral Anatolian group differ significantly from the males of the Central Anatolian group in length and in the cranial index. The males of the Central group have also considerably broader skulls, although the difference is not statistically significant. As for the females, it is unfortunate that in the Central Anatolian group we have only three female skulls, all coming from Alişar Höyük. The average length, breadth and the cranial index of the skulls from the Central group [72] and of the

[72] These measurements are from Krogman : op. cit., 1937.

ten female skulls from the Peripheral Anatolian group are shown below :

	Length	Breadth	Cranial Index
Central Anatolian Group (3)	174.33	141.00	80.88
Peripheral Anatolian Group (10)	174.50	141.15	81.14

A comparison of these figures shows that the females of the two groups are almost identical in average length, breadth and cranial index. This is further borne out by the comparison of the combined males and females of the two groups (see Table 24). From this table it is seen that the differences between the combined males and females of the Central and Peripheral groups are less than three times their probable errors in length, breadth and the cranial index. Thus it is seen that the males of the Peripheral group differ from those of the Central Anatolian group, which probably represent the Hittites proper, while the females of the two groups are almost identical. In other words, the craniological evidence suggests that the women of the Peripheral Anatolian group were Hittites. On the other hand, a part of the males of the Peripheral group probably represent the native Copper Age inhabitants of Anatolia, and the others are foreigners, that is the Assyrians from Kültepe.

In this connection a brief reference may be made to the skulls from Kültepe, which have been included in the Peripheral group. I have already studied nine skulls (one is that of a juvenile) from the 1948 excavation at Kültepe. The four males, which probably represent the Assyrian merchants, are longheaded, with an average cranial index of 72.41. The average cranial index of the four females is 78.11, that is mesocephalic. Of these females, one is dolichocephalic, two mesocephalic (with cranial indices of 78.81 and 79.09, approaching brachycephaly) and one is brachycephalic (cranial index 83.42).

It is known from philological sources that some of the Assyrians at Kültepe had married the natives[73]. It has already been shown that brachycephaly was rare among the Copper Age inhabitants

[73] Bilgiç, E. : Kapadokya tabletlerine göre Anadolu kavimleri üzerinde araştırmalar. *Ankara Üniversitesi Dil ve Tarih--Coğrafya Fakültesi Dergisi (Revue de la Faculté de Langue, d'Histoire et de Géographie, Université d'Ankara)*, Vol. II, No. 1, 1943, p. 34; Bilgiç, E. : op. cit., 1948, p. 513.

of Anatolia and that it became much more frequent in the Hittite period. Thus the presence of brachycephaly among the skulls from Kültepe would suggest that the Hittites had already arrived in Anatolia at that remote time, and that some of these Assyrian merchants had probably married Hittite women. Indeed, it should be mentioned in this connection that Dr. Sedat Alp, from an analysis of the names of some native Anatolians, has already come to the conclusion that the Hittites were established in Anatolia at the time of the Assyrian trading colony at Kültepe[74].

From the difference in the average cranial indices of the males and females from Kültepe and from the Peripheral sites, it has been inferred that some men from these places had probably married Hittite women. This must not, however, be taken to mean that they all married Hittite women, as some must have married Assyrian women and some may have married descendants of the longheaded native Copper Age inhabitants of Anatolia.

As for the cranial types among the inhabitants of Anatolia between 2000-1200 B.C., it has already been noted that there are both longheaded and roundheaded elements among them. The longheaded ones are either the descendants of the longheaded native Copper Age inhabitants of Anatolia [75], or foreigners, such as the Assyrian merchants at Kültepe. It was noted that a large proportion of the Hittite skulls, both male and female, represented by the Central Anatolian group, and a large percentage of the females of the Peripheral group are roundheaded. The morphological cranial types among the roundheaded skulls can now be analyzed.

The roundheaded skulls from Alişar Höyük, which are mostly only moderately brachycephalic, with well-curved occiputs, represent the classical Alpine type[76]. As for the Peripheral group, a female

[74] Alp, S. : Hititlerde sosyal sınıf Nam.Ra'lar ve ideogramın Hititçe karşılığı. *Belleten*, Vol. XIII, No. 50, 1949, pp. 269-270; Alp, S. : Die Soziale Klasse der Nam. Ra-Leute und ihre hethitische Bezeichnung. *Jahrbuch für Kleinasiatische Forschung*, Vol. 1, Heft 2, 1950-51, pp. 125-126.

[75] See Şenyürek, M. S. : op. cit., 1941, pp. 223, 227, 241 and 245; Şenyürek, M. S. : A study of the human skulls from Polatlı Hüyük. *Anatolian Studies*, Vol. 1, 1951, p. 68.

[76] Krogman, W. M. : op.cit., 1937, p. 274; Vallois, H. V. : op. cit., 1939, p. 184; Şenyürek, M. S. : op. cit., 1941, pp. 225, 227, 243 and 245.

skull from Kültepe is of the Alpine type. A female skull (No. XS1) from Tell Al-Judaidah and a female from Troy VI (No. 13 tr.) have also been described respectively by Krogman [77] and Angel [78] as Alpine[79].

A hyperbrachycephalic and hypsicephalic skull of uncertain date from Boz Höyük, first described by Virchow[80], has been attributed to the Western Asiatic brachycephalic type by Krogman [81] and Vallois [82], while it has been described as Eastern Alpine by Angel[83]. The presence of a relatively short and broad face (as calculted from Virchow's measurements [84], the upper facial index is 47.55 and the total facial index is 78.31), is, I believe, in favor of Angel's opinion. In this connection a skull from Kusura (No. ç8.20, male) is also of interest. This moderately brachycephalic and hypsicephalic skull presents an extensive lambdoid flattening, although there is no complete plano-occipital flattening. The upper facial index is mesen (upper facial index 54.81) [85], although it is near the border line of lepten category. The brow ridges of this skull are of medium size and the forehead is of submedium slope. The stature calculated from Pearson's formula (67.049+0.913 femur+0.600 tibia+1.225 humerus−0.187 radius)[86] is 168.27 cm., that is, although in the medium group it is still quite tallish[87]. This individual, on the whole belongs to the Eastern Alpine type, but at the same time shows some Dinaric tendencies. In a hyperbrachycephalic (cranial index 85.88) and slightly hypsicephalic (porion-bregma height-length index 63.52) calva from Karaoğlan (No. II), the occi-

[77] See Krogman, W. M. : op. cit., 1949, Table VI.

[78] See Angel, J. L. : op.cit., 1951, p. 12.

[79] The roundheaded skull No. XS5 from Tell Al-Judaidah has been labelled as M (Mediterranean) by Krogman (?). See Krogman, W. M. : op. cit., 1949. Table VI.

[80] Virchow, R. : op. cit., 1896.

[81] Krogman, W. M. : op. cit., 1937, p. 271.

[82] Vallois, H. V. : op. cit., 1939, p. 187.

[83] Angel, J. L. : op. cit., 1951, pp. 12, 22 and 26.

[84] See Virchow, R. : op.cit., 1896, p. 125.

[85] See Şenyürek, M. S. : op. cit., 1941, Table VI.

[86] See Martin, R. : op. cit., 1928, p. 1070.

[87] The maximum length of the long bones, measured anew by me are as follows: Femur 46.4 cm., tibia 36.75 cm., humerus 33.85 cm., radius 24.9 cm.

put is weakly curved, and shows a large lambdoid flattening[88]. This calva would also seem to come closer to the Eastern Alpine type than to the classical Alpines.

As I pointed out before, one of the skulls from the Hittite stratum of Alişar Höyük (No. b x 43) shows negroid features[89]. But as is shown by the cranial index (81.9), some Alpine blood was also present in this individual who is about 15 years of age. As it is known from historical documents [90] that the Hittites, at least in later years, had used negro slaves, the presence of a negroid skull among the Hittite period crania is easily understood. Thus this young negroid skull can be regarded as that of the son of a negro slave[91].

It is seen that most of the roundheaded Anatolian skulls from 2000-1200 B.C. belong to the classical Alpine type and few to the Eastern Alpine, one of which shows Dinaric tendencies. It is observed that among the remains of the Chalcolithic, Copper Age, Early Bronze Age and Hittite period populations of Anatolia, there are no skulls which can with certainty be attributed to the typical Western Asiatic type[92], which is hyperbrachycephalic, strongly

[88] In their study on this male skull, Kansu and Tunakan (op. cit., 1948, Table I) gave only the breadth (146 ? mm.) and the porion-bregma height (108 mm.). However, as I have recently restored the glabella region of the skull, I have been able to measure the glabello-occipital length, which is 170 mm. The breadth and the porion-bregma height measurements I have taken are the same as those of Kansu and Tunakan.

[89] Şenyürek, M. S.: op. cit., 1941, pp. 224. and 241-242; Şenyürek, M. S. : op.cit., 1948, p. 210.

[90] In a letter from Boğazköy, written in the Akkadian language and in cuneiform writing (For this see: Keilschrifturkunden aus Boghazkoi. Heft III, No. 52 1922, p. 23), which was brought to my attention and kindly translated by Prof. B. Landsberger, it is stated that some male negro slaves and some (more than two) female negro slaves have been sent. Professor Landsberger, according to the oral information he kindly gave to me, believes that this letter was sent by Ramses II to Hattusil (see Şenyürek, M. S. : op. cit., 1941, pp. 224 and 242; Şenyürek, M. S. : op. cit., 1948, p. 210). On this occasion I wish to restate my thanks to Professor Landsberger, now of the Oriental Institute of the University of Chicago.

[91] Şenyürek, M. S. : op. cit., 1941, pp. 224 and 242.

[92] In this study the term "Western Asiatic type", which has already been utilized by others (See Krogman, op. cit., 1937, p. 271), is used as a synonym of the "Armenoid race". The reason for my not using the latter term, which is in common usage, is that it is the name of an ethnic group and that its application to a racial type, which is not confined to one ethnic group but occurs among a

hypsicephalic and long-faced, with conspicuous plano-occipital flattening[93].

It is known that since the time of von Luschan[94] many writers have claimed that the Hittites were of the Western Asiatic type. However, the available craniological evidence[95] indicates that the Hittites proper, on the whole, were not of this type[96] and that this mixed type[97] did not originate in Anatolia[98]. Thus, the craniological evidence, as it stands today, suggests that this type arrived in Anatolia after the collapse of the Great Hittite Empire in about 1200 B. C.[99]

number of Near Eastern nationalities, has been the cause of a great deal of confusion in the literature (see Krogman, W. M.: op. cit., 1937, p. 276; Şenyürek, M. S.: op. cit., 1941, pp. 225 and 242-243; Şenyürek, M. S. : op. cit., 1948, pp. 210-211; Krogman, W. M. : op. cit., 1949, p. 458).

[93] For the characteristics of this type see: Krogman, W. M. : op. cit., 1937, p, 271; Hooton, E. A. : op. cit., 1946, p. 579.

[94] von Luschan, F. : op. cit., 1911.

[95] In this connection I would like to mention that the University of Pennsylvania Expedition excavating Yassı Höyük (Gordion), has found a large number of skeletons from the Hittite period and have brought them to me for study. There is no doubt that the study of these skeletons will greatly add to our knowledge on the anthropology of the Hittite period inhabitants of Anatolia. However, the study of this large collection from the Hittite period, and the large number of skeletons from later periods from this site will take considerable time. On this occassion I wish to extend my thanks and appreciation to Professor R. S. Young, Director of the Expedition, and to Professor R. Edwards, for bringing this valuable collection to me for study.

[96] Krogman, W. M. : op. cit., 1937, p. 274; Şenyürek, M. S. : op. cit., 1941, pp. 226 and 244.

[97] See Krogman, W. M. : op. cit., 1937, p. 271; Hooton, E. A. : op. cit 1946, pp. 579 and 602.

[98] See (a) Krogman, W. M.: op. cit., 1937, pp. 272-273; (b) Şenyürek, M. S.: op. cit., 1941, pp. 225-227 and 243-245. ; (c) Kherumian, R. : Introduction à l'anthropologie du Caucase. Les Arméniens. Librairie Orientaliste Paul Geuthner, Paris, 1943, p. 263.

[99] It should be mentioned here that, in his book published in 1943, Professor Kherumian has advanced the opinion that this type arrived into Anatolia mainly with the Phrygians, from the west (Kherumian, op. cit., 1943, pp. 263-264).

CONCLUSION

The majority of the Chalcolithic and Copper Age inhabitants of Anatolia were dolichocephals of mainly the Eurafrican and Mediterranean types, and that the brachycephals, probably representing the invaders, were rare in these periods[100]. This study has further supported the conclusion that the earliest inhabitants of Anatolia were longheaded, and that the brachycephals came in subsequently[101].

The craniological evidence indicates that an invasion of brachycephals into Anatolia took place during the Chalcolithic period and that it was followed by a second invasion, bringing in the brachycephalic elements to Alaca Höyük and other Copper Age sites, probably at about the middle of the Copper Age[102]. The next invasion of brachyce-

[100] This conclusion I reached in 1941 (Şenyürek, op. cit., 1941), has been accepted and followed by Kansu and Tunakan in their studies of 1945 and 1946 (see Kansu and Tunakan: op. cit., 1945, pp. 414-415 and op. cit., 1946, pp. 542, 546, 547, 549 and 553) and by T. Özgüç in his study of 1948 (see Özgüç, T. : op. cit., 1948, especially p. 150).

[101] Şenyürek, M. S. : op. cit., 1941, pp. 227 and 245.

[102] This is indicated by the study of skulls from Alaca Höyük. The Copper Age deposit in Alaca Höyük has been divided by Dr. Koşay into four building levels, numbered from 5 to 8, of which 5 is the youngest and 8 is the oldest (See Koşay, H.Z. : Türk Tarih Kurumu tarafından yapılan Alaca Höyük hafriyatı. 1936'daki çalışmalara ve keşiflere ait ilk rapor. Ankara, 1938, p. 69). The brachycephalic skulls Nos. XVI (M. R.=Grave R) and XX (M. T.=Grave T) were found in the excavation season of 1935 and the brachycephalic skulls Nos. III, IV and VIII were unearthed in 1936, respectively excavated by Prof. Arık and Dr. Koşay (See Arık, R. O.: Türk Tarih Kurumu tarafından yapılan Alaca Höyük hafriyatı. 1935 deki çalışmalara ve keşiflere ait ilk rapor. Ankara, 1937, pp. 67-98; Koşay, H. Z. : op. cit., 1938, p. 69). According to Dr. Koşay (Koşay, H. Z. : op. cit., 1938, p. 69), Grave R belongs to building level 5, and skulls Nos. III, IV and VIII and grave T belong to building level 6. Brachycephalic skulls Nos. III, IV and VIII were found together with the dolichocephalic skull No. IX and the mesocephalic skulls Nos. II and VII in 1936 and it is believed that these individuals had been caught and killed under the falling stones during an earthquake (see Koşay, H. Z. : op. cit., 1938, p. 69). The evidence of skulls Nos. III, IV and VIII, which appear to have been killed accidentally, clearly shows that the brachycephals were present in Alaca Höyük during building level 6. On the other hand, the dolichocephalic skull designated as grave 1, found in 1944, is from the early part of the Copper Age and the dolichocephalic skull Al. F. No. 1, found in 1941, is from the latter part of the Copper Age.

hals, which was more important and extensive than the previous ones, occurred at about 2000 B.C.[103] This was made by the Hittites who were predominantly of the classical Alpine type [104].

The direct evidence thus shows that the brachycephals are found for the first time in the Copper Age of Alaca Höyük in building level 6. However, it may be pointed out here that Grave K, where Dr. Alp (Alp, S. : op. cit., 1948) has identified some articles as *lituus*, was according to Dr. Koşay found in building level 7 (see Koşay, H. Z. : Les fouilles d'Alaca Höyük. Entreprises par la Société d'Histoire Turque. Rapport preliminaire sur les travaux en 1937—1939. Ankara, 1951, p. 165). Taking this archaeological evidence into consideration, it may be concluded that the brachycephalic elements came into Alaca Höyük either, at the earliest, toward the end of building level 7, or at the beginning of building level 6. At any rate, there is evidence indicating that the brachycephalic elements arrived in Alaca Höyük at approximately the middle of the Copper Age, that is, sometime during the latter half of the second millenium B.C.

[103] Şenyürek, M. S. : op. cit., 1941, pp. 227 and 245.

[104] Ibid., pp. 227 and 245.

TABLE 1

CRANIA STUDIED BY THE WRITER

Sites	Period	Adult [1]	Children [2]	Total
Ahlatlıbel	Copper	4	—	4
Alaca Höyük	Chalcolithic	2	1	3
	Copper	7	4	11
	Early Bronze	1	—	1
Babaköy	Troy II [3] (Copper)	2	—	2
Büyük Güllücek	Chalcolithic	1	—	1
Karaoğlan	Hittite	1	—	1
Kumtepe	Chalcolithic [4]	3	—	3
Kusura [5]	Late Chalcolithic	1	—	1
	Copper	1	1	2
	2000-1900 B.C.	1	—	1
	Hittite	2	—	2
Kültepe	Early part of Second Millenium B.C.	8	1	9
Maşat Höyük	Copper	1	—	1
Polatlı	Level I-Early Copper [6]	—	1	1
	Hittite	1	—	1
Sites around Samsun: Dündartepe, Kaledoruğu and Tekeköy	Copper	16	2	18
Şeyh Höyük [7]	Chalcolithic	5	—	5
Tilkitepe	Chalcolithic	5	—	5
	Copper	4	—	4
Yümüktepe (Mersin)	Chalcolithic	2	—	2
	Total	68	10	78

[1] Most of these skulls are adults, only 6 being subadults.

[2] This group includes children and juveniles up to the age of 15.

[3] These two skulls are the ones found by Dr. Kökten in 1949. See Kökten, İ. K.: op. cit., 1949, p. 813.

[4] One skull (Kumtepe No. 4) is too fragmentary to compute the cranial index, although it appears to be dolichocephalic. See Şenyürek, M. S. : op. cit., 1949.

[5] The crania from Kusura have been assigned to periods according to a recent letter I received from Miss Lamb, the excavator of Kusura (date of the letter July 4, 1951).

[6] See Lloyd, S. and Gökçe, N. : Excavations at Polatlı. A new investigation of second and third millenium stratigraphy in Anatolia. *Anatolian Sudies*, Vol. 1, 1951, pp. 21-62.

[7] See Şenyürek, M. S. and Tunakan, S. : op. cit., 1951.

TABLE 3

CHALCOLITHIC SKULLS (ADULT MALE AND FEMALE)

		Number of Individuals	Average	Range	Standard Deviation	Coefficient of Variation
Male	Glabello-occipital length	12	188.95±1.03	179.00-197.00	5.31±0.72	2.81
	Maximum breadth	12	138.00±1.06	129.00-148.00	5.50±0.75	3.98
	Cranial Index	12	73.08±0.69	66.49- 81.00	3.58±0.49	4.89
Female	Glabello-occipital length	10	183.70±1.58	168.00-196.00	7.43±1.11	4.04
	Maximum breadth	10	133.80±1.86	122.00?-149.00	8.78±1.32	6.56
	Cranial Index	10	72.91±1.02	65.07?- 82.32	4.82±0.72	6.61
Male and Female	Glabello-occipital length	22	186.56±0.99	168.00- 197.00	6.91±0.70	3.70
	Maximum breadth	22	136.09±1.07	122.00?-149.00	7.48±0.75	5.49
	Cranial Index	22	73.00±0.60	65.07?-82.32	4.19±0.42	5.73

TABLE 4

CHALCOLITHIC SKULLS (ADULT MALE AND FEMALE)
DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION [1]

	Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
Male	—	2 (16.66%)	7 (58.33%)	2 (16.66%)	1 (8.33%)	—	—	12
Female	—	3 (30.00%)	3 (30.00%)	3 (30.00%)	1 (10.00%)	—	—	10
Male and Female	—	5 (22.72%)	10 (45.45%)	5 (22.72%)	2 (9.09%)	—	—	22

[1] Martin, R. : Lehrbuch der Anthropologie, 1928, pp. 648-469.

TABLE 5

CHALCOLITHIC SKULLS (SKULLS OF CHILDREN AND ADULTS. BOTH SEXES)
DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION [1]

Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
—	5 (16.66%)	14 (46.66%)	8 (26.66%)	3 (10.00%)	—	—	30

[1] Martin, R. : op. cit., pp. 648-649.

TABLE 6

COPPER AGE SKULLS (ADULT MALE AND FEMALE)

		Number of Individuals	Average	Range	Standard Deviation	Coefficient of Variation
Male	Glabello-occipital length	33	186.62±0.80	172.00-197.00	6.93±0.57	3.71
	Maximum breadth	33	138.77±0.76	121.00-153.00	6.54±0.53	4.71
	Cranial Index	33	74.43±0.43	66.85- 83.52	3.71±0.30	4.98
Female	Glabello-occipital length	18	178.80±0.94	169.00-189.00	5.96±0.66	3.33
	Maximum breadth	18	134.77±1.04	120.00?-149.00	6.59±0.73	4.88
	Cranial Index	18	75.48±0.76	63.82- 83.43	4.84±0.53	6.41
Male and Female	Glabello-occipital length	51	183.86±0.71	169.00-197.00	7.60±0.50	4.13
	Maximum breadth	51	137.36±0.64	120.00?-153.00	6.83±0.45	4.97
	Cranial Index	51	74.80±0.41	63.82- 83.52	4.40±0.29	5.88

TABLE 7

COPPER AGE SKULLS (ADULT MALE AND FEMALE)
DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION [1]

	Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
Male	—	4 (12.12%)	16 (48.48%)	9 (27.27%)	4 (12.12%)	—	—	33
Female	1 (5.55%)	1 (5.55%)	6 (33.33%)	7 (38.88%)	3 (16.66%)	—	—	18
Male and Female	1 (1.96%)	5 (9.80%)	22 (43.13%)	16 (31.37%)	7 (13.72%)	—	—	51

[1] Martin, R. : op. cit., pp. 648-469.

TABLE 8

COPPER AGE SKULLS (SKULLS OF CHILDREN AND ADULTS. BOTH SEXES)
DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION [1]

Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
1 (1.56%)	5 (7.81%)	28 (43.75%)	20 (31.25%)	8 (12.50%)	2 (3.12%)	—	64

[1] Martin, R. : op.cit., pp. 648-649.

TABLE 9

CHALCOLITHIC AND COPPER AGE SKULLS (ADULTS)

		Chalcolithic Skulls (Average)	Copper Age Skulls (Average)	Difference	Probable error : of difference [1] = $0.67449\sqrt{\frac{\sigma_1^2}{N_1}+\frac{\sigma_2^2}{N_2}}$
Male	Glabello-occipital length	188.95±1.03	186.62±0.80	2.33	1.30
	Maximum breadth	138.00±1.06	138.77±0.76	0.77	1.31
	Cranial Index	73.08±0.69	74.43±0.43	1.35	0.81
Female	Glabello-occipital length	183.70±1.58	178.80±0.94	4.90	1.84
	Maximum breadth	133.80±1.86	134.77±1.04	0.97	2.14
	Cranial Index	72.91±1.02	75.48±0.76	2.57	1.28
Male and Female	Glabello-occipital length	186.56±0.99	183.86±0.71	2.70	1.22
	Maximum breadth	136.09±1.07	137.36±0.64	1.27	1.24
	Cranial Index	73.00±0.60	74.80±0.41	1.80	0.72

[1] From Chambers, E. G. : Statistical Calculation for beginners. Cambridge, 1945, p. 35.

TABLE 11

EARLY BRONZE AGE SKULLS FROM ALİŞAR HÖYÜK (FROM KROGMAN) [1]

		Average	Range
Adult Male Skulls (2 specimens)	Glabello-occipital length	180.5	175-186
	Maximum breadth	142.5	139-146
	Cranial Index	79.1	74.7-83.4
Juvenile Skulls (1 specimen)	Glabello-occipital length	174.0	—
	Maximum breadth	135.0	—
	Cranial Index	77.6	—

[1] Krogman, op. cit., 1937, tables II, III, IV and V.

TABLE 12

ANATOLIAN SKULLS FROM 2000 TO 1200 B. C. (ADULT MALE AND FEMALE)

		Number of Individuals	Average	Range	Standard Deviation	Coefficient of Variation
Male	Glabello-occipital length	22	186.13±1.43	170.00-205.00	10.00±1.01	5.37
	Maximum breadth	22	143.59±0.78	134.00-152.00	5.52±0.55	3.84
	Cranial Index	22	77.37±0.76	65.36- 85.29	5.37±0.53	6.94
Female	Glabello-occipital length	13	174.46±1.30	156.00?-187.00	6.96±0.88	3.98
	Maximum breadth	13	141.11±1.21	133.00-151.00	6.50±0.85	4.60
	Cranial Index	13	81.08±1.14	71.12-96.79?	6.15±0.80	7.58
Male and Female	Glabello-occipital length	35	181.80±1.19	156.00-205.00	10.50±0.84	5.77
	Maximum breadth	35	142.67±0.68	133.00-152.00	6.00±0.47	4.20
	Cranial Index	35	78.75±0.60	65.36- 96.79	5.30±0.42	6.73

TABLE 10

THE SKULLS FROM THE CHALCOLITHIC AND COPPER AGE STRATA OF ALACA HÖYÜK

	Chalcolithic Skulls				Copper Age Skulls													
	Al. J. M I ♂	Al.H. M II ♂	Al. 15 (child)	Average Males (2)	Mezar 1 (Grave 1) ♂	XVI ♂	IV ♂	II ♂ (17 yrs.)	Average Males (4)	XX ♀	VII ♀	9 ♀ (17-18 yrs.)	Average Females (3)	1946 Copper (1 year)	VIII ♂ (6 yrs.)	Al. F. No 1 ♂ (11-12 yrs.)	III ♀ (11 yrs.)	Average Children(4)
Glabello-occipital length	192.00?	185.00	175.00	185.00	188.00**	179.00***	176.00	183.00	181.50	169.00***	174.00	172.00	171.66	160.00	161.00	175.00*	202.00??	174.50
Maximum breadth	148.00*	139.00	131.00	143.50	137.00**	146.50	147.00	140.00	142.62	141.00***	138.00	127.00	135.33	120.00	140.00	130.00*	170.00?	140.00
Cranial Index	77.08	75.13	74.85	76.10	72.87**	81.84	83.52	76.50	78.68	84.43***	79.31	73.83	79.19	75.00	86.95	74.28	84.15??	80.09

* These measurements are the same as those of Kansu and Tunakan, op. cit., 1946.
** These measurements and index are the same as those of Kansu and Tunakan, op. cit., 1945.
*** These measurements and index are the same as those of Kansu, op. cit., 1937.

TABLE 2

SKULLS STUDIED BY OTHER WRITERS
(ANGEL, EHRICH, HOUZÉ, KROGMAN AND VIRCHOW)

Site	Period	Adult [1]	Children	Total
Alişar Höyük [2]	Chalcolithic	1	1	2
	Copper	7	3	10
	Early Bronze	2	1	3
	Hittite Empires	11	1	12
Babaköy [3]	Troy II[4] (Copper)	1	—	1
Boz Höyük [5]	Hittite Period (?) [6]	1	—	1
Chatal Höyük and Tell Al-Judaidah [7]	Phase G (3500-3100 B.C.-Chalcolithic)	2	—	2
	Phase M(1600-1200B.C.) (Hittite Empires Period)	7	—	7
	Phase M-N (Phase N= 1200-1000B.C.)(Included in Hittite EmpiresPeriod)	1	—	1
Gözlükule [8]	Early Cemetery (Chalcolithic ?)	1	4	5
	8. M. Level - 2000 B. C. (Included in 2000-1200 B. C.)	1	—	1
Hanai Tepe (B) [9]	Troy II-III?[10] (Copper)	1	—	1
Troy [11]	Troy I (Chalcolithic)	—	1	1
	Troy II (Copper)	2	2	4
	Troy III (Copper)	2	—	2
	Troy III-IV (Copper)	1	—	1
	Troy IV (Phase V) (Copper)	1	—	1
	TroyVI(1900-1300B.C.)[12] (Hittite Empires Period)	1	—	1
Yortan Kelembo [13]	Troy II[14] (Copper)	1	—	1
	Total	44	13	57

[1] Most of these are adults, only three being subadults.

[2] From Krogman, W. M.: op. cit., 1937.

[3] From Angel, J. L. : op. cit., 1939.

[4] According to Angel, J. L. : op. cit., 1951, p. 8.

[5] From Virchow, R. : op.cit., 1896, pp. 123-126.

[6] For the date of this skull Krogman (op. cit., 1937, p. 271) states : "*Since, iron slag, evidence of a knowledge of smelting iron ore, was found in the mound (ibid., p. 19f), the date will be little if at all before 1500 B. C.*" But, as is also pointed out by Angel, the exact age is not known (See Angel, op. cit., 1951, p. 12).

[7] From Krogman, W. M. : op. cit., 1949.

[8] From Ehrich, R. : op. cit., 1940.

[9] From Virchow, R. : op. cit., 1882.

[10] According to Angel, J. L. : op. cit., 1951, p. 10

[11] From Angel, J. L. : op.cit., 1951.

[12] Troy periods have been assigned to Chalcolithic, Copper and Hittite Empires times, according to the figures given by Blegen (1940), and the table of T. Özgüç. See Blegen, C.W., in *The American Journal of Archaeology*, Vol. XLIV, No. 3, 1940, p. 365, and Özgüç, T., op. cit., 1945, table.

[13] From Houzé, M. : op. cit., 1903.

[14] According to Angel, J. L. : op. cit., 1951, p. 8.

TABLE 13

THE SKULLS OF ANCIENT INHABITANTS OF ANATOLIA BETWEEN 2000-1200 B.C. (ADULT MALE AND FEMALE). DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION [1]

	Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
Male	—	1 (4.54%)	7 (31.81%)	8 (36.36%)	3 (13.63%)	3 (13.63%)	—	22
Female	—	—	2 (15.38%)	5 (38.46%)	4 (30.76%)	1 (7.69%)	1 (7.69%)	13
Male and Female	—	1 (2.85%)	9 (25.71%)	13 (37.14%)	7 (20.00%)	4 (11.42%)	1 (2.85%)	35

[1] Martin, R. : op. cit., pp. 648-649.

TABLE 14

THE SKULLS OF ANCIENT INHABITANTS OF ANATOLIA BETWEEN 2000-1200 B.C. (SKULLS OF CHILDREN AND ADULTS. BOTH SEXES). DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION [1]

Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
—	1 (2.70%)	9 (24.32%)	14 (37.83%)	8 (21.62%)	4 (10.81%)	1 (2.70%)	37

[1] Martin, R. : op. cit., pp. 648-649.

TABLE 15

THE SKULLS OF ANCIENT INHABITANTS OF ANATOLIA BETWEEN 2000-1200 B.C. (ADULT MALE AND FEMALE). THE SKULLS FROM THE CENTRAL ANATOLIAN AREA

		Number of Individuals	Average	Range	Standard Deviation	Coefficient of Variation
Male	Glabello-occipital length	14	181.78±1.60	170.00-198.00	8.93±1.13	4.91
	Maximum breadth	14	144.71±0.88	134.00-151.00	4.93±0.62	3.40
	Cranial Index	14	79.77±0.78	73.62- 88.24	4.41±0.78	5.52
Male and Female	Glabello-occipital length	17	180.47±1.43	168.00-198.00	8.79±1.01	4.87
	Maximum breadth	17	144.05±0.80	134.00-151.00	4.95±0.59	3.43
	Cranial Index	17	79.97±0.66	73.62- 88.24	4.07±0.46	5.08

TABLE 16

THE SKULLS OF THE ANCIENT INHABITANTS OF ANATOLIA BETWEEN 2000-1200 B.C. (ADULT MALE AND FEMALE). THE SKULLS FROM THE PERIPHERAL ANATOLIAN AREAS

		Number of Individuals	Average	Range	Standard Deviation	Coefficient of Variation
Male	Glabello-occipital length	8	193.75±1.39	186.00-205.00	5.86±0.98	3.02
	Maximum breadth	8	141.62±1.41	134.00-152.00	5.93±0.99	4.18
	Cranial Index	8	73.18±0.99	65.36- 78.61	4.19±0.70	5.72
Female	Glabello-occipital length	10	174.50±1.60	156.00-187.00	7.55±1.68	4.32
	Maximum breadth	10	141.15±1.51	133.00-151.00	7.14±1.07	5.05
	Cranial Index	10	81.14±1.48	71.12- 96.79	6.97±1.04	8.59
Male and Female	Glabello-occipital length	18	183.05±1.80	156.00-205.00	11.34±1.27	6.19
	Maximum breadth	18	141.36±1.05	133.00-152.00	6.64±0.74	4.69
	Cranial Index	18	77.60±1.12	65.36- 96.79	7.11±0.79	9.16

TABLE 17

THE SKULLS OF ANCIENT INHABITANTS OF ANATOLIA BETWEEN 2000-1200 B.C. (ADULT MALE AND FEMALE). THE SKULLS FROM THE CENTRAL ANATOLIAN AREA. DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION [1]

	Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
Male	—	—	3 (21.42%)	5 (35.71%)	3 (21.42%)	3 (21.42%)	—	14
Female	—	—	—	1 (33.33%)	2 (66.66%)	—	—	3
Male and female	—	—	3 (17.64%)	6 (35.29%)	5 (29.41%)	3 (17.64%)	—	17

[1] Martin, R. : op. cit., pp. 648-649.

TABLE 18

THE SKULLS OF ANCIENT INHABITANTS OF ANATOLIA BETWEEN 2000-1200 B.C. (SKULLS OF CHILDREN AND ADULTS OF BOTH SEXES). THE SKULLS FROM THE CENTRAL ANATOLIAN AREA. DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION [1]

Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
—	—	3 (16.66%)	6 (33.33%)	6 (33.33%)	3 (16.66%)	—	18

[1] Martin, R. : op. cit., pp. 648-649.

TABLE 19

THE SKULLS OF ANCIENT INHABITANTS OF ANATOLIA BETWEEN 2000-1200 B.C. (ADULT MALE AND FEMALE). THE SKULLS FROM THE PERIPHERAL ANATOLIAN AREAS. DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION[1]

	Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
Male	—	1 (12.50%)	4 (50.00%)	3 (37.50%)	—	—	—	8
Female	—	—	2 (20.00%)	4 (40.00%)	2 (20.00%)	1 (10.00%)	1 (10.00%)	10
Male and Female	—	1 (5.55%)	6 (33.33%)	7 (38.88%)	2 (11.11%)	1 (5.55%)	1 (5.55%)	18

[1] Martin, R. : op. cit., pp. 648-649.

TABLE 20

THE SKULLS OF ANCIENT INHABITANTS OF ANATOLIA BETWEEN 2000-1200 B.C. (SKULLS OF CHILDREN AND ADULTS OF BOTH SEXES). THE SKULLS FROM THE PERIPHERAL ANATOLIAN AREAS. DISTRIBUTION OF CRANIAL INDICES ACCORDING TO GARSON'S CLASSIFICATION [1]

Ultradolichocephalic (x-64.9)	Hyperdolichocephalic (65-69.9)	Dolichocephalic (70-74.9)	Mesocephalic (75-79.9)	Brachycephalic (80-84.9)	Hyperbrachycephalic (85-89.9)	Ultrabrachycephalic (90-x)	Total
—	1 (5.26%)	6 (31.57%)	8 (42.10%)	2 (10.52%)	1 (5.26%)	1 (5.26%)	19

[1] Martin, R. : op.cit., pp. 648-649.

TABLE 21

THE ANATOLIAN SKULLS FROM THE COPPER AGE AND FROM BETWEEN 2000-1200 B. C. (ADULTS)

		Copper Age	2000-1200 B. C.	Difference	Probable error : of difference[1] = $0.67449\sqrt{\frac{\sigma_1^2}{N_1}+\frac{\sigma_2^2}{N_2}}$
Male	Glabello-occipital length	186.62±0.80	186.13±1.43	0.49	0.54
	Maximum breadth	138.77±0.76	143.59±0.78	4.82	0.44
	Cranial Index	74.43±0.43	77.37±0.76	2.94	0.39
Female	Glabello-occipital length	178.80±0.94	174.46±1.30	4.34	0.62
	Maximum breadth	134.77±1.04	141.11±1.21	6.34	0.62
	Cranial Index	75.48±0.76	81.08±1.14	5.60	0.58
Male and Female	Glabello-occipital length	183.86±0.71	181.80±1.19	2.06	0.44
	Maximum breadth	137.36±0.64	142.67±0.68	5.31	0.37
	Cranial Index	74.80±0.41	78.75±0.60	3.95	0.32

[1] From Chambers, E. G.: op. cit., p. 35.

TABLE 22

SKULLS FROM THE COPPER AGE AND FROM 2000-1200 B.C. (ADULTS)

		Copper Age	Skulls from 2000-1200 B.C. : Skulls from Central Anatolian Area	Difference	Probable error : of difference[1] = $0.67449\sqrt{\frac{\sigma_1^2}{N_1}+\frac{\sigma_2^2}{N_2}}$
Male	Glabello-occipital length	186.62±0.80	181.78±1.60	4.84	0.62
	Maximum breadth	138.77±0.76	144.71±0.88	5.94	0.49
	Cranial Index	74.43±0.43	79.77±0.78	5.34	0.43
Male and Female	Glabello-occipital length	183.86±0.71	180.47±1.43	3.39	0.54
	Maximum breadth	137.36±0.64	144.05±0.80	6.69	0.43
	Cranial Index	74.80±0.41	79.97±0.66	5.17	0.38

[1] From Chambers, E. G.: op. cit., p. 35.

TABLE 23

SKULLS FROM THE COPPER AGE AND FROM 2000-1200 B.C. (ADULTS)

		Copper Age	Skulls from 2000-1200 B.C.: Skulls from Peripheral Anatolian Areas	Difference	Probable error : of difference [1] = $0.67449\sqrt{\frac{\sigma_1^2}{N_1}+\frac{\sigma_2^2}{N_2}}$
Male	Glabello-occipital length	186.62±0.80	193.75±1.39	7.13	1.61
	Maximum breadth	138.77±0.76	141.62±1.41	2.85	1.60
	Cranial Index	74.43±0.43	73.18±0.99	1.25	1.08
Female	Glabello-occipital length	178.80±0.94	174.50±1.60	4.30	1.86
	Maximum breadth	134.77±1.04	141.15±1.51	6.38	1.84
	Cranial Index	75.48±0.76	81.14±1.48	5.66	1.80
Male and Female	Glabello-occipital length	183.86±0.71	183.05±1.80	0.81	0.59
	Maximum breadth	137.36±0.64	141.36±1.05	4.00	0.47
	Cranial Index	74.80±0.41	77.60±1.12	2.80	0.46

[1] From Chambers, E. G. : op. cit., p. 35.

TABLE 24

ANATOLIAN SKULLS FROM 2000-1200 B. C. (ADULTS)

		Skulls from 2000-1200 B.C.: Central Anatolian Group	Skulls from 2000-1200 B.C.: Peripheral Anatolian Group	Difference	Probable error : of difference[1] = $0.67449\sqrt{\frac{\sigma_1^2}{N_1}+\frac{\sigma_2^2}{N_2}}$
Male	Glabello-occipital length	181.78±1.60	193.75±1.39	11.97	2.13
	Maximum breadth	144.71±0.88	141.62±1.41	3.09	1.66
	Cranial Index	79.77±0.78	73.18±0.99	6.59	1.27
Male and Female	Glabello-occipital length	180.47±1.43	183.05±1.80	2.58	2.15
	Maximum breadth	144.05±0.80	141.36±1.05	2.69	1.71
	Cranial Index	79.97±0.66	77.60±1.12	2.37	1.62

[1] From Chambers, E. G. : op. cit., p. 35.