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THE ANATOLIANS OF THE LATE NEOLITHIC AND CHALCOLITHIC AGE

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Foreword - Notes of Technique

In the tables of data I indicated the measurements in numerical order following Martin-Saller's Handbook, but in the summary-tables where I consider only 11 essential characters, this order is altered because I want to keep together the traits which logically go by couples, as: (a) the two fundamental measurements of the skull (maximum length and breadth); b) the two vault heights (auricular and basibregmatic); (c) the two measurements of the face (upper facial height and bizygomatic breadth); (d) the two measurements of the nose (height and maximum breadth of the *apertura piriformis*); (e) the three indices: cranial, upper facial, and nasal.

In the tables of data, for each character or measurement, the first horizontal line of figures refers to males, the second one to females. Owing to the fact that the exact sexing of the skeletal remains, and particularly of the skulls is difficult and the answer very dubious, I compared and analyzed the intersex (asexual) values, adding, when in suitable cases, the male and female values.

In order to reduce the cost of printing of tables, I indicated the measurements with the numbers used by Martin-Saller, while, to make identification easy, I list them here below in numerical order

(a)	(b)	(c)	(d)
1	g–op	L	Max. len.
2	g–i	–	Skull len. glabella-inion
3	g–l	–	Skull len. glabella-lambda
5	ba–n	LB	Basinasal len.
7	ba–o	FL	Foraminal len.
8	eu–eu	B	Max. br.
9	ft–ft	B'	Min. frontal br.
10	co–co	B''	Max. do.
11	au-au	–	Biauricular diamet.
12	ast–ast	biast. B.	Biasterionic br.
13	ms–ms	–	Bimastoideal br.
16	–	FB	Foraminal br.
17	ba–b	H'	Basibregmatic hei.
20	po–b	–	Project. porion-bregma hei.
21	po–v	OH	Auricular hei.
22	–	–	Hei. of calvarium
23	–	GLU	Horizont. circumfer. at g and op.
24	po–b–po	T	Ver. arc over bregma
24a	au–b–au	–	do.
25	n–o	S	Tot. sagittal arc
26	n–b	S1	Frontal arc
27	b–l	S2	Parietal arc
28	l–o	S3	Occipital arc
29	n–b	S'1	Frontal ch.
30	b–l	S'2	Parietal ch.
31	l–o	S'3	Occipital ch.
38	–	C	Capacity in cm^3
40	ba–pr	GL	Basiprosthionic len.
43	fmt-fmt	–	Orbitofacial br.
44	ek-ek	–	Biorbital br.

(a)	(b)	(c)	(d)
45	zy–zy	J	Bizygomatic br.
45(2)	–	MC	Intermalar br. or Malar ch.
47	n–gn	GH	Tot. facial hei.
48	n–pr	G'H	Upper facial hei.
48a	on–pr	–	from do. ophryon.
49a	d–d	DC	Interorbital width
50	mf–mf	IOW	do. do.
51	mf–ek	O1	Orbital br.
51a	d–ek	O'1	do.
52	–	O2	Orbital hei.
54	–	NB	Nasal br.
55	n–ns	NH'	do. hei.
	n–na	NH	do. to nariale
60	pr–alv	ML	Maxillo-alveolar len.
61	ekm-ekm	MB	do. br.
62	ol–sta	G'1	Palatal len.
63	enm-enm	G2	do. br.
65	kdl–kdl	w1	Bicondylar br.
66	go–go	gogo	Bigonial br.
68	–	cl	Corpus len.
69	id–gn	h1	Symphyseal hei.
69(1)	–	–	Corpus hei. at *foramen mentale*.
69(3)	–	–	Corpus thickness
70	go–	cy	Project. len. of condyle.
71a	–	rb'	Min. br. of ramus
72	–	P	Francfort facial an.
72(4)	–	–	Cuvier do.
72(5)	–	–	Alveolar an.
74	–	–	Profil alveolar an.
79	–	–	Gonial an. or Mandibular an.
79(1)	–	–	Symphyseal an.

with the corresponding symbols of "Biometrika" and the letters representing the anatomical landmarks. The equivalence is not always perfect, but I reduced the discrepancies to a minimum. Often the scholar who gives us his measurements, does not indicate the landmarks for the traits which normally can be measured in more than one way, as for instance, the orbital breadth, the interorbital width, the nasal height, the vault height, etc. For the sake of comparison, I took these values as being reliable, and made only a minor check, and I indicated them with the more generally followed or more appropriate Martin-Saller's numbers.

In tables and text I used the following notations: A - Arithmetic mean; D - Difference between means; CV - coefficient of variation; N-number of skulls; P - Probability level by Fisher's tables of t-values: PE - probable error of mean or $\pm$; V - Variance; n - Degrees of freedom; t - Student's t - test values; σ - Sigma or SD.; Δ - Delta or value of the oscillation field of the theoretical mean.

Measurements

Abbreviations: (a) Martin-Saller's number; (b) anatomical landmarks; (c) "Biometrika" symbols; (d) traits; len-length; br-breadth ; hei-height; max-maximum; min-minimum; ch-chord; tot-total; ver-vertical; an-angle; i-index.

INDICES

I 1	100 (8/1)	100 (B/L)	Cranial i.
I 2	100 (17/1)	100 (H'/L)	Hei.-len. i.
I 3	100 (17/8)	100 (H'/B)	Hei.-br. i.
I 4	100 (20/1)	100 (H/L)	Aur. hei. -len. i.
I 5	100 (20/8)	100 (H/B)	Aur. hei. -br. i.
I 12	100 (9/10)	100 (B'/B")	Transversal frontal i.
I 13	100 (9/8)	100 (B'/B)	do. fronto-parietal i.
I 14	100 (12/8)	100 (biast. B/B)	do. parieto-occipital i.
I 22	100 (29/26)	100 (S'1/S1)	Sagittal frontal i.
I 24	100 (30/27)	100 (S'2/S2)	do. parietal i.
I 25	100 (31/28)	100 (S'3/S3)	do. occipital i.
I 33	100 (16/7)	100 (FB/FL)	Foraminal i.

I 38	100 (47/45)	100 (GH/J)	Tot. facial i.
I 39	100 (48/45)	100 (G'H/J)	Upper facial i.
I 42	100 (52/51)	100 (O2/O1)	Orbital i.
I 42a	100 (52/51b)	100 (O2/—)	do.
I 42b	100 (52/51a)	100 (O2/—)	do.
I 48	100 (54/55)	100 (NB/NH)	Nasal i.
I 54	100 (61/60)	100 (MB/ML)	Maxillo-alveolar i.
I 58	100 (63/62)	100 (G2/G'1)	Palatəl i.
I 60	100 (40/5)	100 (GL/LB)	Gnathic i.
I 62	100 (68/65)	100 (cl/w_1)	Mandibular i.
I 63	100 (71a/70)	100 (rb'/cy)	Ramus i.
I 66	100 (69(3)/69(1)	100 (——)	Hei.-thickness i.
I 71	100 (45/8)	100 (J/B)	Transverse cranio-facial i.
I 72	100 (9/43)	100 (B1/—)	Fronto-biorbital i.
I 73	100 (9/45)	100 (B1/J)	Zygo-frontal i.

The Anatolian Proto-Mediterraneans

My work concerns the problem of the anthropological structure of the Anatolian population during the Late Neolithic and the Chalcolithic times. It is primarily based on the skeletal remains dating approximately up to the middle of the II millennium B. C., i.e. up to the beginning of the Iron Age. In this period the culture of Man developed from the simple collection of natural products and the activity of hunting and fishing to agriculture, breeding and rural settlements, and then to the imposing urban communities, reaching the apices of the Hittite civilization.

The chief aspect of such an evolution is the expansion of agriculture and farming activities. But, in the progress of time, some settlements developed quicker than others, and in some local populations, at different chronological levels, showed different aspects, manifestations, and characteristics. In some of these centers there was rapid substitution of primitive dwellings for houses and buildings, the simple places of cult became temples, the chiefs of tribes transformed themselves into monarchs, and consequently some settlements greatly increased their density of population in which various strata of the society arose automatically from the working classes upwards.

This Anatolian population formed part of the Asian Proto-Mediterraneans who extended in the epoch covered by my study from the Atlantic to Bengal, living on the coastal regions of the Mediterranean Sea and on its islands, and in the Asian territories approximately from the Aegean and Phoenician Seas to the Ganges, and from the Caspian Sea and Turkestan to the River Godavary in India, if not further south still. These Anatolians formed a comparatively homogeneous population, with a fairly low rate of expansion, living in sizeable local agglomerations, in independent and endogamous communities, in which the individuals showed a remarkable unity and similarity of somatic and cultural characteristics. These elements represent a morphological and psychological evolution with converging trends. Although there is no correlation between the genotypical and cultural aspects, this contemporaneousness is of considerable significance.

Archaic Settlements

Undoubtedly the greatest part - the most archaic certainly - of the Anatolian settlements represented what in demogenetics is called "small populations", a concept linked with that of "minimal populations", in which the demographic phenomena have great importance. Such minimal populations are conditioned to a demographic structure defined by its numerical limits. When these are overstepped the small population – generally an endogamous tribe – having lost its precarious demographic equilibrium, begins to enter into an involutive process and generally dwindles. Such, in my opnion, was the end of many Anatolian archaic settlements which have shown a sudden interruption in their occupation. In many such cases the causes generally and traditionally indicated by many scholars (invasions, migration, destruction by natural agents or by enemies) ought to be excluded, whereas the primary cause is a demographic involution due to: (a) a constant low birth-rate; (b) a high generic mortality (c) a very high infant mortality; (d) very long intergenesical interval; (e) division of the tribe into endogamous circles; (f) very small rate of natural increase which was practically negligible in the Neolithic and Prehistoric times.

Anatolian Regional Type

The recognition of a Proto-Mediterranean Type is subject to difficulties and uncertainties, not only on account of its conceptual implication, but also because of morphological and biometrical aspects. There is, on the one hand a complex of physical characters in a field of extensive variety of permutations and combinations, and on the other hand, the initial isolation of human groups furnished with strong endogamy in particular habitats. Such a two-fold aspect of this Western Asian primary population explains the slight variability of the somatic characters and the differentiation of the population into distinct settlement types. It is true that we cannot always count on a concrete example, because the so-called "ethnical type", in my opinion, is rather the statistical complex of a series of independent variabilities than a predeterminated feature.

I have differentiated the Anatolian Regional Type among the others of the Asian Proto-Mediterraneans by following the convergence of the cultural elements around the various types of uniform settlements, the phenotypical similarity, and the concentration of the anthropometrical values of their skeletal remains. To represent the Type I therefore availed myself of the following elements: (a) the static existence of the settlements from the archaic times up to the beginning of the Iron Age; (b) their isolation in various degree; (c) the lack of intermixture, because there was no migration or invasion of different genotypes; (d) the progressive brachycephalization; (e) the morphological study of the skeletal remains; (f) the calculations of the anthropometrical data.

This Type is thus represented by a number of skeletal remains in which a certain morphological homogeneity is recognisable. In addition I have taken into account both the social and/or cultural isolation of the settlement-populations and their genetical segregation. The calculation of data shows whether they represent samples taken at random, and further, which are the variations from the Type mean and what is the value of the test-differences. The scarcity of the material often makes any analysis nearly impossible. The conclusions however, make me suppose that there exists more than one morphological tendency in the Type.

In short, this concept of "Anatolian Type" is an attempt to summarize in a single expression both a phenotypical group of biological unities and a genetical distribution. It represents the group of individuals who have lived in the same region and habitat, in a wide sense, and in the same chronological period. I describe the Type by some generalizations which may be synthetical, i.e. by mean values and other biometrical constants, or analytical, i.e. by classes of individuals.

Biometrical Elaboration of Data - Variability

The procedure and the calculations on biometrical lines form an integral part of the morphological examination, but its conclusions are subordinate to the latter. Often a subjective examination is absolutely insufficient to fix the general aspect because of the limited number of skulls available. Normally, a few remains cannot be said to represent the population to which they belong, but they could be considered as "randomized samples" and therefore their data can be elaborated sufficiently by the "small samples methodology" giving conclusive result.

The Anatolian Proto-Mediterraneans, owing to the enormous area of residence and many millennia of development, show a certain degree of somatic variability in their skeletal remains, but this is not such as to isolate them from the fundamental typology. It is evident that such differences are of decisive importance. I have therefore calculated and analyzed them from both the morphological and the biometrical[1] aspects, and on the other hand, the degree of the intra-and inter-group variability of the somatic characters. In these small populations isolation has greatly favoured both the individual and intra-group variability. I see, in fact, a direct relation between genetical isolation (which is often also geographical) and demogenetical homogeneity, and, on the other hand, specialization of the envi-

[1] With Student's t-test (which derives form the "small samples theory") we ascertain whether a difference between two means be real or casual. The t-values indicate the degree of probability with which the casual values can produce a difference analogous to that we have found. We assume, by convention, that a difference be "significant" when the value of the said probability reaches the figure of 5/100 or 0.05.

ronment (progressive culture) and characterization of the physical aspect of the population. The size of population has a decisive importance; the smaller it is, the swifter is the reduction of its somatic variability, so that in small populations the genetical homogeneity and the stabilization of the somatology may be reached comparatively very swiftly in a randomized sense. Therefore the physical characters acquire independence from whatever selective advantage they may have. In addition, the generally predominant endogamy maintains low variability or actually causes its decrease.

The intra-group somatic variability is based on the individual differences between the unities which compose the settlement (its population) and which are postulated by the process of natural selection. Therefore the study of its effects upon a certain character must start by fixing the frequency of individuals who manifest a certain degree of divergence in respect to such a character. The mean-value indicates therefore the level of the phenotype or characterizes the phenotype itself. The second step in this analysis is to ascertain the value of the inter-group somatic variability, i.e. the phenotypical affinities of each population (settlement) in respect to all the others[1].

The Brachycephalization Problem

The greatest part of the skulls of the Anatolians which form the object of my study are dolichocephalic, but there are also mesocephalic and brachycephalic skulls. The phenomenon of brachycephalization does not appear in the various Regional Types of the Asian Proto-Mediterraneans on the same chronological level, because it is shown very early in the Troad Type (towards the middle of the

[1] The analysis of variance permits us to calculate the level of variability as in the following paradigm :

Source of variability	Sum of of squares	Degrees of freedom	Variance estimate
Within samples, i.e. intra-group variability	a	b	a/b=w
Between samples, i.e. inter-group variability	c	d	c/d=z

IV millennium), in the Mesopotamian Type (towards 1900 at Kish), in the Anatolian Type (towards 2500 in Alişar Höyük), and much later in the Syro-Palestinian Type (towards 1500 B.C.).

In my opinion brachycephalization consists in an evolutive continual movement subsequent to the longhead-forms of the Palaeolithics and Neolithics and it is essentially the constant flexible settlement of the various cranial unities through the aggreagate morpho-architectural forces, which respond to the anatomical and functional factors in reciprocal adaptation and, as such it represents a phylogenetic evolution independent from any racial difference. I have therefore rejected the thesis which, particularly for Asia, has been propounded in many instances, i.e. that the brachycephalics formed a population of their own with own centres of irradiation, and that they had migrated in various directions during the Late Neolithic and Chalcolithic times, and that there are two brachycephalic Races, the Alpine and the Armenoid.

My own views are (1) there is no evidence of brachycephalic populations in the period covered by my study, which might have influenced the local fundamental dolichocephaly; (2) there is no element proving migration of populations from one region to another in the mentioned period; (3) that the Alpine and Armenoid represent morphoarchitectural development of the brachycephalization process, and are no independent genetic unities. They are not at all Races in genetic sense, but only morphological differentiations.

Skeletal Remains

I cite 14 settlements where skeletal remains have been found, and I present for each summary information and anthropometrical data. These 14 populations cover approximately the whole area of Anatolia. I have ranged them following four local groups, as : (a) the settlements of the so-called Troad Anatolia (Baba Köy, Kumtepe, Hanaytepe, Hisarlık); (b) the settlement of Kusura; (c) the settlements of the southern, eastern and partially central regions (Polatlı Höyük, Ahlatlıbel, Yümük Tepe, Şeyh Höyük, Tilki Tepe); (d) the settlements of the so-called Hittite region, between the rivers Kızıl and Kelki (Büyük Gülücek, Osmankayası, Alaca Höyük, Alişar Höyük),.

In the relatively Recent Bronze Age or Hittite Period the custom was to cremate. For this reason the Osmankayası remains, which have been dated approximately 1550 B. C. and have been studied by Schaeuble, are scarce, difficult to handle, and allowed only a few measurements. In early times (Late Neolithic and Chalcolithic Age) the inhumation was general.

Settlements And Their Skeletal Remains

(1) Babaköy

This settlement is located on the right bank of the river Simav, towards its southern bend at the level approximately of the small town of Sindirghi, at about 120 miles from Troy. During the excavations of 1936 a single skeleton was found, belonging to the II Stratum Troy, i.e. with an approximate date of 2600 B.C. It was that of an adult male, not old, with a rather massive skull, ellipsoid in form, with oblong orbits and non-prognatous profile. Its stature was calculate as 1632. Angel's measurements of this skull are listed as follows:

M	Value	M	Value	M	Value	M	Value	M	Value
1	183.0	26	123.0	47	118.0?	69	39.0	I 22	91.1
5	105.0?	27	131.0	48	69.0?	71a	38.0	I 24	90.1
8	133.0	28	119.0	49a	24.0?	72	86.0	I 25	82.4
9	95.0	29	112.0	51a	39.0	72(5)	70.0	I 38	93.7
10	120.0	30	118.0	52	33.0	I 1	72.7	I 39	54.8?
17	140.0	31	98.0	54	23.0?	I 2	76.5	I 42b	84.6?
20	121.0	38	1430	55	50.0?	I 3	105.3	I 48	46.0?
23	510.0	40	100.0?	60	59.0?	I 4	66.1	I 54	106.8?
24a	312.0	44	99.0	61	63.0?	I 5	91.0	I 62	79.2
25	376.0	45	126.0?	65	120.0?	I 12	79.2	I 71	94.7
				66	107.0?	I 13	71.4	I 73a	75.4

This local Type may be compared (a) with the Anatolian Type, and (b) with each of the other local Types. For the former the variability degree is negligible, because, according to the Sigma-Criteri-

on[1], all the measurements less two fall within $A \pm 1\sigma$; these are the two heights of the vault (the auricular height and the basibregmatic height) which slightly overstep $A \pm 1\sigma$. The local population, therefore, represents a normal randomized sample of the whole Anatolian population. The calculation of the differences of mean gives an index of inter-group somatic variability of 90.2, which is very close to the theoretical mean of the Anatolians.

(2) Kumtepe

This settlement is located very near to Troy (3 miles) north eastwards of it, on the western bank of the river Menderes (classical Skamander). During the excavations of 1934 four skeletons were found and ascribed: one to Troy Stratum I (ca. 3200 B. C.), two others with date about 2800, and the fourth to about 2500. They were buried in the earth, and found nearly complete, but in very bad condition, with bones in fragment, and no possibility of reconstruction. The skull No 2 (dated ca. 2500) afforded some measurements, a few the skull No 3 (dated ca. 3200), and only the biasteric breadth the skull No 4 (dated ca. 2800).

These skeletons have been studied and measured by Kansu and Angel, and successively by Şenyürek. The sex is very uncertain: Kansu considered all four to be females, but Angel and Şenyürek's opinion is that the calvarium No 2 is male (of about 25 years); certainly all four are adult. Şenyürek repaired skulls No 1 (dated ca. 2800), No 3 and No 4, and obtained some uncertain measurements. His opinion was that Nos 3 and 4 represented the Eurafrican Type of the Mediterraneans, and that No 2 is a hypsicephalic Alpine (the same was Kansu's opinion). The calculated statures were: No 2-1605; No 3-1547; No 4-1521. I list on the next page the amalgamated data obtained by the three scholars.

[1] The Sigma-Criterion (σ) or Sigma-Test derives from: (a) the concept that the curve of the values of the characters of homogeneous biological unities is generally "normal" or nearly "normal"; (b) in this case the area under the curve represents "probability"; (c) 99.73 % of this area falls between the values of three times the SD. (or σ) of the arithmetic mean (A) of the series. By convention therefore, it is assumend that a given value or a sample belongs to the series when its value falls within its mean $\pm 3\sigma$, i.e. $A \pm 3\sigma$.

I analyzed this local Type under two aspects: (a) the intra-group somatic variability; (b) the inter-group somatic variability. The value of the former is rather high (7.7) againat the Anatolian mean (4.5). This is due to the intrinsic heterogeneousness of the Aegean Coastal population, who showed a very precocious brachycephalization, with consequent influence on some skull traits. For the latter I calculated 67 differences of means, 52 of which are "not-significant". The inter-index is then 77.6. This value is rather lower than the Anatolian mean (83.3), but does not exceed the limits of its field of variation. Checking the various measurements with the Sigma-Test, the result shows that all of them fall within the field of $A \pm 3\sigma$, (five within $A \pm 1\sigma$, one within $A \pm 2\sigma$).

M	Skull No. 2 ♂ value	Three ♀ Skulls A	M	No. 2 ♂ value	Three ♀ A	M	No.2 ♂ value	Three ♀ A
1	179.0	193.0	66	108.0	90.0	I 2	70.4	—
8	145.0?	136.7?	69	34.0	32.0	I 3	93.8	—
9	96.0	99.0	69 (1)	32.0	31.0	I 4	64.8	—
12	—	99.0	69 (3)	13.0	11.5	I 5	80.0	—
13	134.0	—	70	52.0	52.0	I 13	66.2	70.7
17	136.0?	—	71a	26.0	28.0	I 14	—	79.2
20	116.0?	—	79	120.0	123.0	I 63	50.0	53.8
38	1440	—	79 (1)	60.0	64.0	I 66	40.6	37.1
45	135.0	—	I 1	81.0?	73.9?	I 71	93.1	—
						I 73a	71.1	—

These four skulls represent a period of more than half a millennium. Are there significant differences in this long pericd? It is difficult to give a positive answer, as the sexing is uncertain and the measurements are unsure. Undoubtedly the four unities are rather dissimilar, as shown by the intra index (7.7). With some caution it may be said that those values are aberrant.

(3) Hanaytepe

This is a settlement located in the proximity of Hissarlik. During the excavations made in ground coeval with Troy III (ca. 2300 B. C.)

fourteen adult skulls were found. Three of them are supposed to be male and elevent female. Some of them allowed only a few measurements (Virchow). The population of this settlement belongs to the Troad Type and therefore shows some heterogeneous in the morphoarchitecture of the skulls. Only three traits have been measured, and therefore the intra-index is not evidential. All the values of measurements fall within the field of $A \pm 1\sigma$, which allows us to consider this archaic population as a normal sample of the Anatolians. Te inter-index is rather low: 68.3.

(4) Hisarlık (Troy)

This is the locality where the remains of Troy have been found and excavated. It is at the marshy mouth of the river Menderes (classical Skamander) and its tributaries, towards the Dardanelles. The settlement revealed a long period of human occupation, divided in various strata which, following Angel's studies and including the remains of Kumtepe, can be dated approximately as follows: Stratum I-3200 B.C.; II-2600; III-2300; IV-2200, V-2050; VI-1900. There are other strata successive to the VI; I have not considered these together with the skeletal remains found there, because my study ends at the beginning of the Iron Age.

It is generally assumed that the Trojan chronology is represented by the so-called "Dörpfeld's nine cities of Troy" with a very long period of occupation. Cities I-V represent a period of cultural continuity corresponding to the Aegean Early Bronze Age in the III millennium. City VI accounts for the early and middle part of the II millennium, and city VII corresponds to the whole of the XIII century B.C.; its first sub-division may be identified with the "Homeric Troy". The cities, having been raised one over the other, have left imposing vertical remains. so that Blegen has detected no less than 46 building periods.

It is now well known that, while Schliemann thought to have found "Priam's treasure" these valuable objects belonged to the last period of City II in which presumably an earthquake destroyed the settlement in the III millennium. Blegen dates the beginning of City VI to a little before 1725, and its final destruction by earthquake to 1275. The ninety or so years which followed (City VIIa) would

account for the lifetime of the "Homeric City" which rose upon its ruins.

The skeletal remains of Hisarlık have been studied and measured by Angel who has recorded nine skulls of the prehistoric period, which is covered by my study. In addition he has examined two other coeval skulls existing in Athens and Istanbul. Previously, Virchow and Houzé examined six other skulls considered also by Angel who therefore relied on a total of 17 skulls. Only 12 are considered in my investigation; they come from the following strata: I, dated ca. 3200, one only; II, dated ca. 2600, five; III, dated ca. 2300, three; IV, dated ca. 2200, V, dated ca. 2050, and VI, dated ca. 1900, one each. Not all these twelve skulls come from the Troy excavations; five of them, belonging to the same periods and culture, have been added by Angel to his series. They are: a male found in Boz Höyük near the river Sakarya (classical Sangarius); a male found in Antiparos, isle of the Cyclades; a male found in Yortan near the river Simav at the level of Babaköy; a female found in Hanaytepe very near to Hisarlık; a male found in Thermi, Lesbos island.

These 12 skulls, all in bad condition, show little uniformity and limited somatic homogeneity, particularly as revealed examining the crania, and that was also Angel's judgement. In my opinion the lack of homogeneity is principally due to the precocious brachycephalization of the pre-historic populations of the Aegean coast. Some statures have been calculated, as a male-1571, a second male-1690, a female-1524. The constants I calculated on Angel's data are indicated on the next page (362).

The Hisarlík skulls represent a very long and uninterrupted settlement which may be dated, with some caution, from the Neolithic times up to 1900 B.C., i.e. one and a half millennium more or less. Six different values of the cranial index can be identified, each corresponding to a progressive date, as: 65.5 ca. 3200 B. C.; 76.0 ca. 2600; 71.1 ca. 2300; 81.6 ca. 2200; 88.2 ca, 2050 and ca. 1900, showing a constant evolution to brachycephalization, These values are a function of the increase of the bi-euryonic breadth in most while the maximum length has also contributed in some way (corresponding to the six dates above mentioned): its values are 103.0, 185.3, 191.3, 179.0, 170.0, and 170.0. All the other characters show

M	N	A	±	SD.	M	N	A	±	SD	M	N	A	±	SD.
1	7	188.0	2.98	11.7	44	4	96.5	0.65	1.9	I 1	6	74.1	1.84	6.7
	5	181.3	2.33	7.7		2	96.5	—	—		4	73.9	2.06	6.1
5	3	100.3	—	—	45	4	131.5	0.67	2.0	I 2	6	72.6	1.13	4.1
	1	106.0	—	—		3	123.3	—	—		3	71.9	—	—
8	7	142.3	1.82	7.1	47	4	111.5	2.54	7.5	I 3	6	95.3	1.65	6.0
	5	138.8	3.03	10.0		2	108.0	—	—		3	96.9	—	—
9	7	95.7	1.13	4.4	48	5	68.2	1.53	5.1	I 4	6	62.9	1.20	4.4
	4	92.8	0.58	1.7		3	63.7	—	—		4	63.6	1.17	3.5
10	5	117.0	1.13	3.7	49a	4	24.2	1.47	4.4	I 5	6	82.7	1.52	5.6
	3	116.2	—	—		2	23.0	—	—		4	86.3	2.20	6.6
17	6	134.8	0.88	3.2	51a	8	38.6	1.37	5.8	I 12	6	80.4	1.18	4.3
	3	134.0	—	—		3	39.3	—	—		3	80.3	—	—
21	6	117.0	1.16	4.2	52	6	32.8	0.56	2.0	I 13	7	62.2	1.48	5.8
	4	117.0	1.37	4.1		4	31.5	3.12	9.3		4	66.8	1.81	5.9
23	7	527.3	3.58	14.0	54	5	23.7	0.25	0.8	I 22	3	86.6	—	—
	4	510.0	4.83	14.3		3	23.7	—	—		1	86.1	—	—
24a	3	316.6	—	—	55	5	52.2	1.01	3.4	I 24	3	88.1	—	—
	1	303.0	—	—		3	47.0	—	—		1	90.5	—	—
25	5	374.2	7.92	26.2	60	2	56.0	—	—	I 25	3	85.9	—	—
	1	382.0	—	—		2	51.5	—	—		1	85.2	—	—
26	5	127.8	2.11	7.3	61	4	66.0	0.83	2.4	I 38	4	86.4	2.96	8.8
	1	129.0	—	—		3	63.3	—	—		2	91.9	—	—
27	5	131.4	5.03	16.6	65	2	120.0	—	—	I 39	5	52.6	1.18	3.9
	1	137.0	—	—		1	111.0	—	—		3	52.0	—	—
28	5	115.2	2.20	7.6	66	4	94.7	1.52	4.5	I 42b	4	85.2	2.05	6.1
	1	115.0	—	—		2	90.7	—	—		3	78.6	—	—
29	3	113.6	—	—	69	5	32.0	0.84	2.7	I 48	5	45.4	1.12	3.7
	1	111.0	—	—		2	27.5	—	—		3	50.7	—	—
30	3	119.3	—	—	69(3)	–	—	—	—	I 54	2	117.1	—	—
	1	124.0	—	—		1	14.0	—	—		2	119.8	—	—
31	3	99.6	—	—	71a	2	33.5	—	—	I 71	6	91.7	1.55	4.3
	1	98.0	—	—		2	31.0	—	—		3	86.6	—	—
38	6	1478	17.56	62.4	72	2	91.0	—	—	I 73a	5	69.0	1.38	4.9
	4	1391	24.89	73.9		1	86.0	—	—		3	75.3	—	—
40	2	96.0	—	—	74	1	64.0	—	—					
	1	98.0	—	—		1	61.0	—	—					

a singular stability, as for instance the basibregmatic height with the following values: 138.0, 136.3, 133.3, 131.0, 133.0 (for the first five dates only).

On analysis of the somatic variability, the two known indices show rather contrasting figures, the "intra" being 5.4 (rather near to the Anatolian Type value 4.5), and the "inter" being 93.5, which is one of the highest in the range of this index. The two indices are in some way independent, and with very different basis, and therefore the contradiction is only apparent. The inter-value shows that the Hisarlık population undoubtedly formed part of the whole Anatolian strain, while the intra-value indicates that it was far from being somatically homogeneous, which is due, as I mentioned before, to the early process of brachycephalization. The fact that all the essential measurements of these skulls fall within the limits of $A \pm 1\sigma$ is a confirmation of my unitarian thesis.

(5) Kusura

Kusura is located between the two branches of the river Menderes (Meander), in Southern Anatolia on the line Afyon Karahisar - Hamitabat (classical Isparta) westward of Lake Egridir. During the excavations conducted by Miss Lamb (1935-1938) she determined an archaeological sequence of village settlements dating from the Late Copper Age (ca. 2400) to the Early II millennium B. C. (ca. 1800). The cultural remains had much in common with those on the Anatolian Plateau, but were at the same time linked to the Aegean settlements by the frequent similarities with Trojan materials. Kusura then represents a first step towards cross-dating between the two Anatolian regions. The second step is represented by the investigation on the settlement of Demirci Höyük westward of Eskişehir excavated by Bittel.

In Kusura some skeletal material has been discovered: 31 long bones and 13 skulls, forming some skeletons, of which two male and one female, all adult, ascribed to the Copper Age (ca. 2400 B.C.) and two adult male skeletons belonging to the Recent Bronze or Hittite Period (ca. 1800). The material has been studied by Kansu and Atasayan, who determined also the stature of a male as 1688, and a female as 1603, both of the Recent Bronze. I have calculated the essential constants, which are indicated on the next page.

I have analyzed the difference existing between the two male skulls of the Copper Age and the two similar ones of the Recent Bronze times which are separated by more than half a millennium. The result I obtained shows: (a) a general tendency to brachycephalization, as the corresponding cranial indices are 74.6 and 79.9 But the latter is not the consequence of a larger bi-euryonic breadth, but of a more roundish form of the parietal bones with reduction of the maximum length; (b) a slight rise of the auricular height from 114 to 119; (c) a very slight change in the morphoarchitecture of the splancnocranium, as, for instance, the upper facial index is from 53.0 to

M	N	A	±	SD.	M	N	A	±	SD.	M	N	A	±	SD.
1	4	182.8	2.46	7.2(a)	51a	4	41.5	0.20	0.6	I 4	4	63.9	1.40	4.1
5	4	100.8	1.15	3.4	52	4	32.3	0.42	1.3	I 5	4	82.7	1.06	3.2
8	4	141.0	1.67	4.9(b)	54	4	24.8	1.00	2.9	I 13	4	66.3	1.04	6.3(e)
9	4	93.5	0.41	1.2(c)	55	4	48.0	0.83	2.4	I 39	2	53.9	—	—
17	4	130.2	2.46	7.2	60	4	52.8	0.97	2.9	I 42b	4	77.8	1.18	3.5
20	4	116.5	1.02	3.0	61	4	63.0	0.67	2.0	I 48	2	47.7	—	—
40	4	98.5	1.94	5.7	I 1	4	77.3	1.35	4.0(d)	I 54	4	119.3	0.82	2.5
45	4	133.5	0.59	1.7	I 2	4	71.1	2.42	7.2	I 71	3	92.1	—	—
48	4	69.8	1.25	3.7	I 3	4	91.8	2.25	6.7	I 73a	3	70.2	—	—

(a) 1 ♀ 177.0; (b) 1 ♀ 128.0; (c) 1 ♀ 91.0; (d) 1 ♀ 72.3; (e) 1 ♀ 71.1.

54.8, the nasal index from 52.2 to 52.4, the upper facial height from 70.0 to 69.5, the bi-zygomatic breadth from 132,0 to 135.0. The intra-group somatic index is practically the same (4.2) as that of the Anatolian Type (4.5). The inter-index, similarly to that shown by Hisarlık series is one of the best in the range of this index (92.5) and indicates that the population of Kusura formed a "casual sample" of the Anatolians. This is confirmed by the fact that the single values of the characters fall within the field of the Regional Type $A \pm 1\sigma$, less one ($A \pm 2\sigma$).

(6) Polatlı Höyük

Polatlı Höyük is located 47 miles south of Ankara, east of the river Sakarya and south of Mt Chilek. During some archaeological excavations some skeletons in bad condition were unearthed. They possibly represent five individuals of which No. 2 (male, about 15

years old, dated III millennium) was represented by some portion of the axial skeleton and skull, No. 5 by three cranial fragments, and No. 4 (male, about 30 years old, dated ca. 1300 B. C.) by a calvarium and mandible. Nos 1 and 3 permitted no measurements. I list here below the measurements which could be obtained:

Skulls				Skulls			Skulls			
M	No. 2	No. 4	A	M	No. 2	No. 4	M	No. 2	No. 4	A
1	192.0?	198.0?	195.0?	69	—	34.0	I 3	—	96.6	96.6
8	139.0?	147.0?	143.0?	71	—	31.5	I 4	59.8?	58.6	59.2?
17	—	142.0?	142.0?	I 1	72.4?	74.2?	I 5	82.7?	78.9	80.8?
20	115.0	116.0	115.5	I 2	—	71.7				

Skulls No. 2 and 4 are separated by approximately 1300 years, but their morphological aspect is the same, the few essential characters which permit the measurement show a remarkable similarity with negligible differences. This confirms the genetic continuity of this settlement. The intra-group somatic index is very low (2.9), but it must be considered with reserve as it is based on four measurements only. The inter-index is indeed very good-87.9- Checking the single values with the Sigma-Criterion against the Anatolian Type Means, three values fall within $A \pm 1\sigma$ and two into $A \pm 2\sigma$.

(7) Ahlatlıbel

This settlement is located at 7-8 miles southwest of Ankara, It was excavated by Koşay and yielded (1933) 18 skeletons of the Copper Age (about 2400 B. C.). Kansu examined these remains

M	N	A	M	N	A	M	N	A	M	N	A	M	N	A
1	4	190.0(a)	17	1	141.0	66	2	95.5	79	3	118.7	I 5	4	82.7(f)
7	1	33.0	20	4	117.0(c)	69	2	33.5	I 1	4	74.2(d)	I 13	3	67.3
8	4	141.5(b)	26	2	135.5	69(1)	2	32.5	I 2	1	73.1	I 22	2	87.1
9	3	95.7	29	2	118.0	70	2	55.5	I 3	1	101.4	I 33	1	103.0
13	1	122.0	65	2	118.0	71a	2	32.0	I 4	4	61.4(e)	I 37	1	158.7
16	1	34.0										I 63	2	57.5

(a) ± 0.78-SD.3.3; (b) ± 1.08-SD.3.2; (c) ± 1.79-5.3; (d) ± 0.47—1.4; (e) ± 0.74 —2.2; (f) ± 1.15—3.4.

and measured four skulls. In addition he calculated the stature of a male (1652) and a female (1632). I indicate at the foot of the previous page the constants I could calculate:

The intra-index may be only partially calculated, being 3.3 with four characters. The inter-index is 67.2, one of the lowest of the range of these values. The single measurements, however, fall all less one within the limits of $A \pm 3\sigma$ (four within $A \pm 1\sigma$, one within $A \pm 2\sigma$). We assume therefore that the Ahlatlıbel population formed a "casual" sample of the Anatolians.

(8) Yümüktepe

This settlement is located on the outskirts of modern Mersin, by the Gulf of Alexandretta in South Anatolia. During the excavations executed by the Neilson Expedition under the direction of Garstang, various skeletal remains of the Copper Age (about 2400 B. C.) have been found. Of these the most important are two calvaria restored (H. 2 and H. 5) deduced to be adult females, and an adult skull (Burial III) – about 30 years old –. These remains have been studied by Şenyürek, who attributed one calvarium to the Mediterranean Type, and the other calvarium and the male skull to the Euafrican Type of the Mediterraneans. He calculated the stature of a young individual as 1616. I indicate as follows the essential data of these skulls :

One male

M	Bur. III	M	Values	M	Values	M	Values	M	Values
1	197.0(a)	9	94.0	27	132.0	69(1)	34.0 (c)	I 4	60.7
2	188.0	20	119.5	28	125.0	10	62.0	I 5	91.2
3	191.0	23	520.0	38	1433	71	32.0 (d)	I 13	71.8
8	131.0(b)	24	305.0	66	103.0	I 1	66.5 (e)		

(a) Two ♀ A=182.0; (b) Two ♀ A=127.5; (c) One ♀ 28.5; (d) One ♀ 34.0; (e) Two ♀ A=70.3.

Both the indices of somatic variability are not good, specially the intra-index (9.9), the "inter" being 78.8. The single values, according to the Sigma-Criterion, are shown to belong to the Anatolian Type as "casual samples", four falling within $A \pm 1\sigma$, and one within $A \pm 2\sigma$.

(9) Şeyh Höyük (Tell eş-Şeyh)

This settlement lies to the south of the Alexandretta Gulf, on the bank of the Orontes River (now Nahr el'Asi). During the excavations conducted by Dönmez, Öğün and Sinclair Hood, under Sir Leonard Woolley's direction in 1948, some skeletal remains were found in a large and deep grave, into which the bodies have been thrown in a disorderly manner; the skeletons were therefore broken and intermixed. The remains are dated approximately to the first half of the IV millennium. Tunakan and Şenyürek have measured some complete skeletons and five crania which they attributed to the Eurafrican Type of the Mediterraneans. Some of these show signs of artificial deformation the first example in Anatolia. Some statures have been calculated: Two males A-1688, B-1626, three females C-1675, D-1538, E-1473. I indicate in the following table the essential means I calculated on the original data :

M	N	A	M	N	A	M	N	A	M	N	A	M	N	A	M	N	A
1	2	190.5	23	2	522.0	52	2	35.8	65	1	117.0	I 3	2	98.0	I 42b	2	89.3?
	3	189.0?		3	504.3		2	34.3		1	117.0		2	109.3		2	82.1
8	2	138.5	45	2	131.5	54	2	27.0?	66	1	96.5	I 4	2	60.2	I 48	2	48.7
	3	126.7?		3	119.3		3	25.3		2	93.3		3	59.9		3	51.0
9	2	96.5	47	2	119.0?	55	2	55.5	70	2	65.5	I 5	2	92.8	I 54	2	123.9
	3	88.8		3	111.2		3	49.7		3	53.0		3	89.4		3	112.5
17	2	135.5	48	2	72.3	60	2	54.5	71	2	35.3	I 13	2	69.7	I 63	2	53.9
	2	135.0		3	67.7		3	52.7		3	32.5		3	70.3		3	61.3
20	2	114.5	51a	2	40.1	61	2	67.5	I1	2	72.7	I 38	2	90.5?	I 71	2	94.9
	3	113.2			41.8		3	59.3		3	67.0?		3	93.1?		3	94.2
									I2	2	71.2	I 39	2	55.0	I 73a	2	73.4
										2	72.8		3	56.7?		3	74.4

These data show a very good somatic homogeneity for the population of Şeyh Höyük, being the mean SD. 4.1 and the "inter-index" 84.3, both indicating that it formed part of the Anatolians. Of the 11 essential characters, ten fall within the limits of $A \pm 1\sigma$ and one into $A \pm 2\sigma$.

(10) Tilkitepe

This is a locality on the eastern bank of Lake Van in Eastern Anatolia. During the archaeological excavations, an adult female

skeleton of the Late Neolithic (ca. 3500 B. C.), and five adult male and six adult female skeletons of the Copper Age (ca. 2400 B. C.) were found. I indicate here below the essential constants I could calculate :

M	N	A	±	SD.	M	N	A	±	SD.	M	N	A	±	SD.
1	5	186.6	1.51	4.0	52	3	31.0	–	–	I 5	5	80.1	0.01	0.0
	7	179.3	0.33	1.3		–	–	–	–		6	77.8	0.15	0.5
8	5	137.6	0.00	0.0	54	3	23.8	–	–	I 13	5	72.8	0.17	0.5
	7	140.3	1.10	4.3		–	–	–	–		7	67.7	0.69	2.7
9	5	100.2	0.33	1.1	55	3	49.1	–	–	I 39	5	50.6	0.05	0.2
	7	95.0	0.28	1.1		–	–	–	–		–	–	–	–
17	5	130.1	0.25	0.8	60	3	59.0	–	–	I 42b	3	81.1	–	–
	–	–	–	–		–	–	–	–		–	–	–	–
20	5	110.8	0.33	1.1	61	3	66.0	–	–	I 48	3	48.0	–	–
	6	105.8	0.55	2.0		–	–	–	–		–	–	–	–
40	5	92.5	2.07	6.8	I 1	5	73.9	0.39	1.3	I 54	3	111.9	–	–
	–	–	–	–		7	78.2	0.61	2.4		–	–	–	–
45	5	128.4	0.18	0.6	I 2	5	71.1	0.40	1.3	I 71	5	92.8	0.18	0.6
	5	118.0	0.00	0.0		–	–	–	–		5	86.7	0.00	0.0
48	5	65.3	0.00	0.0	I 3	5	94.1	0.15	0.5	I 73a	5	78.0	0.26	0.9
	–	–	–	–		–	–	–	–		5	80.5	0.14	0.5
51a	3	38.3	–	–	I 4	5	59.8	0.01	0.0					
	–	–	–	–		6	59.3	0.21	0.8					

This population shows the highest somatic homogeneity among the Anatolian settlements, since the intra-index is only 1.8. But in contrast the inter-index is 65.8, the lowest of the range. That means that the somatic variability within the small population was practically negligible due to its isolation and strict endogamy, and this explains also why the group was rather different (in index-value) from the other local Types. However the Sigma-Criterion test shows that this population belongs to the Anatolians (all the measurements of the 11 essential characters fall within $A \pm 1\sigma$). It is impossible, though so interesting – to compare the female skull of the Late Neolithic with the group of the Copper Age females, as the former is only a skull fragment.

(11) Büyük Güllücek

This settlement is located in the vilayet of Çorum at about 10 miles east of the river Kızıl at north of Boğazköy. It is the first of

the settlements of the so-called Hittite region that I have considered. During the excavations of 1947 a skeleton was discovered belonging to a male of about 30 years of age, buried directly into the earth. It has been dated to the Copper Age, at the end of the IV or beginning of the III millennium (ca. 3200 B. C.). It has been studied by Şenyürek who considered the individual to be a hypsicephalic of the Eurafrican Type of the Mediterraneans, and calculated its stature as 163. I list the measurements as follows :

M	Values	M	Values	M	Values	M	Values	M	Values	M	Values
1	187.5	20	113.5	45	133.0?	69(1)	31.0	I 2	74.1	I 42b	79.5
8	133.0	23	522.0	51a	39.0	70	67.5	I 3	104.5	I 62	79.2
9	104.0	24a	312.0	52	31.0	71	30.0	I 4	60.5	I 63	44.4
17	139.0	38	1417	65	120.0	I 1	70.9	I 5	85.3	I 71	100.0?
								I 13	78.2	I 73a	78.2

The inter-index (91.2) is a very good indication that this population belongs genetically to the Anatolians, and such is confirmed by the Sigma-Criterion test for which four of the measurements fall within $A \pm 1\sigma$, and the other two within $A \pm 2\sigma$.

(12) Osmankayası

This settlement is located a little northeast of the ruins of the ancient capital of the Hittite State, Hattusa, the present Boğazköy. This is the second settlement of the Hittite region that I have considered. It has been explored by decades, but only in 1952 Bittel discovered a number of skeletal remains, some calcinated after ritual cremation and some as grave remains or bones contained in funeral urns. The material, which has been dated 1700-1400 B. C., was in very bad condition.

A very diligent and painstaking examination of the remains has been made in Istanbul by Schaeuble, who inspected: (a) 12 individuals of both sexes and of various ages; (b) the remains of other 36 individuals coming from graves and urns. But he has only been able to consider a skull without its mandible, some calvaria (skulls without the facial bones), some calottes (calvaria without the basal portion), some mandibles and long bones. Owing to the state of the

material Schaeuble's measurements are relatively few, but they are precious the same for identifying the somatic Type of the population of the so-called Hittite region (with Alaca, Alişar and Büyük).

In my calculations of data I used only adult or sub-adult measurements, and the constants are here below indicated :

M	N	A	M	N	A	M	N	A	M	N	A	M	N	A
1	9	181.0(a)	9	3	95.3	17	–	–	I 2	–	–	I 13	3	66.9
	7	176.4(b)		3	97.0		1	125.0		–	70.2		3	69.0
5	–	–	11	2	119.5	20	4	106.3(2)	I 3	–	–	I 39	–	–
	1	95.0		2	111.0		2	111.0		1	91.9		1	49.2?
8	9	141.3(c)	12	2	102.0	38	–	–	I 4	4	56.7(h)	I 42b	–	–
	6	138.8(d)		2	103.0		1	1350?		1	65.7		1	82.0
						I 1	9	78.3(f)	I 5	4	75.2(i)	I 48	–	–
							6	78.7(g)		2	78.4		1	47.7

(a) PE.2.03—SD.9.0; (b) 1.43—5.6; (c) 0.96—4.3; (d) 1.32—4.8; (e) 3.19—9.5; (f) 1.01—4.5; (g) 1.13—4.1; (h) 3.16—9.4; (i) 2.13—6.9.

The figure of the "intra-index" (6.3) is not wholly indicative as it is based on four characters only. For instance, the similar figures for highly homogeneous local Types are: Alaca 4.9, Polatlı 3,7, Tilki 3.5, Ahlatlı 2.6, Şeyh 5.8, and Kusura 6.0. The "inter"-index is moderately high (75.3). However the Sigma-Test clearly shows that this local Type falls within the normal curve of the Anatolians, with four measurements into $A \pm 1\sigma$, and one into $A \pm 2\sigma$.

(13) Alaca Höyük

This settlement is located northeastward of Boghazköy, at 45 miles from Chorum (Çorum). It is the third settlement of the region of the so-called Hittite Plateau that I have considered in my study. During the 1936 excavations a female skeleton of about 17-18 years of age (No. 9) was found and has been attributed to the Copper Age (ca. 2400 B.C.). It has been examined and measured by Kansu, Tunakan and Şenyürek. Two infant skeletons (Nos. III and VIII), and a male skeleton of about 17 years (No. II) have also been found. These last remains have been described and measured by Kansu, and restored and measured by Şenyürek who indicated the young men as a Mediterranean with a stature of 1604.

During successive excavations, in 1943, other remains of the Copper Age (ca. 2400 B. C.) were found, and they were some nearly complete skeletons and a skull, all buried in a grave enclosed by stone slabs and partially in funeral jars. These remains have been studied by Şenyürek and Kansu who calculated some statures: one male(?) 1418, a second male(?) 1650. I list here below the constants I calculated :

M	N	A	M	N	A	M	N	A	M	N	A	M	N	A
1	6	179.5(a)	50	1	24.0	65	3	124.0	I 1	6	79.4(m)	I 42b	3	76.1
	4	171.0(b)		–	–		1	140.0		5	78.7(n)		3	83.8
8	6	142.7(c)	51a	3	38.5	66	3	97.8	I 2	1	76.8	I 48	1	43.2
	4	136.7(d)		4	38.3(i)		1	100.0		–	–		3	47.8
9	6	96.2(e)	52	2	30.8	69	2	29.8	I 3	1	102.2	I 54	5	121.1(s)
	5	97.7(f)		3	31.0		1	30.0		–	–		2	116.2
17	1	142.0	54	2	25.3	69(1)	2	29.3	I 4	4	61.6(o)	I 63	3	53.9
	–	–		5	22.5(j)		1	31.0		4	61.4(p)		1	53.3
20	4	112.2(g)	55	1	55.5	69(3)	3	12.2	I 5	5	75.9(q)	I 66	2	41.6
	4	106.0(h)		3	46.0		1	12.0		4	80.9(r)		1	38.7
45	1	121.0	60	5	52.0(k)	70	3	57.5	I 13	2	69.5	I 71	–	–
	3	116.0		2	52.5		1	60.0		1	74.8		3	84.1
48	1	69.5	61	5	63.0(l)	71	3	31.0	I 39	1	57.4	I 73a	1	79.5
	3	63.0		2	61.0		1	32.0		3	54.3		3	84.2

(a) PE.1.72—SD.6.3; (b) 0.45—1.3; (c) 1.16—4.2; (d) 0.96—2.9; (e) 0.75—2.7; (f) 0.54—1.8; (g) 1.75—5.2; (h) 0.67—2.0; (i) 0.84—2.5; (j) 0.26—0.9; (k) 1.23—4.1; (l) 1.07—3.5; (m) 1.11—4.0; (n) 0.92—3.0; (o) 0.82—2.4; (p) 0.34—1.0; (q) 2.71—9.0; (r) 0.16—0.5; (s) 1.15—3.8;

Both "intra" and "inter-"indices are very good, the former being 3.5, the latter 82.6; the same for the Sigma-test: the values for nine characters falls within $A \pm 1\sigma$, for two into $A \pm 2\sigma$. All data show that the Alaca population formed integral part of the Anatolians.

(14) Alişar Höyük

This settlement is located south of the river Çekerek and southeast of Boghazköy, at about 60 miles from modern Amasya. It is the fourth and last settlement of the so-called Hittite Plateau that I consider in my study. In 1927 an expedtion of the Oriental Institute

(founded by Rockefeller) of the University of Chicago, under the direction of von der Osten and Schmidt, undertook the excavations at Gâvur Kalesi, a mound known as Alişar Höyük. Seven cultural periods have been identified but only the first ones are of interest in my study, i.e. (a) Late Neolithic, ca. 3500 B.C.; (b) I Period, Copper Age, ca. 2400; (c) II Period, Early Bronze Age, ca. 2400-2000; (d) III Period, Later of Recent Bronze Age, also so-called Hittite Period, ca 2000-1200. During the excavations 53 skeletons and single skulls were found; they represent therefore one of the largest prehistoric series (the largest from Anatolia) and a continuity of skeletal remains covering nearly two and a half millennia.

Krogman has studied morphologically all the material giving sex and age distinctly by Period. His opinion is that in the I Period there are Proto-Mediterraneans; in the II and III there appear skulls with mesocephalic form and what he calls Alpinoid (ca. 2500), although there remains still a large quantity of dolichocephalic skulls. My analysis leads to a considerably different result, also as regards the racial hypothesis. I considered the skulls of the first Periods, as follows: (a) Late Neolithic (ca. 3500) 2♀; (b) I Period (ca. 2400) 7 ♂ and 3 ♀; (c) II Period (ca. 2200) 3 ♂; (d) III Period (ca. 1600) 8 ♂ and 5 ♀; a total of 18 ♂ , and 10 ♀.

The Period previous to the Copper Age shows some traces of a Neolithic Population and a simple and primitive culture, and yielded few skeletal remains. The bodies were buried directly in the earth, between stone slabs and there were some bones in funeral jars. The skulls are dolichocephalic, very narrow, with a low calvarium, narrow face, high and narrow nose. So few remains allow no biometrical elaboration of data, which is possible only for the two male series of the I and III Periods. The comparison between these two series of skulls is of the greatest importance in order to eliminate the thesis that the Hittite was a particular population (III Period) extraneous to the Anatolians and forming its own genetic strain. My morphological examination and the analysis of data ascertained: (a) the morphoarchitectural evolution of the male skulls after nearly a millennium, (b) the level of the brachycephalization at the beginning of the Iron Age, (c) the continuity *in loco* of the same population. I give here below the values of the constants for the 11 essential characters distinctly by Periods :

Late Neolithic			Copper Age (ca. 2400)				Early Bronze		Recent Bronze or Hittite Period (ca. 1600)			
M	N	A	N	A	±	SD.	N	A	N	A	±	SD.
1	–	—	6	182.1	2.00	7.3	2	180.5	8	812.9	1.86	7.8
	1	179.0	1	177.0	—	—	–	—	3	174.3	—	—
8	–	—	6	135.0	1.25	4.6	2	142.5	8	144.6	1.34	5.6
	1	130.0	1	137.0	—	—	–	—	3	141.0	—	—
20	–	—	6	112.8	0.74	2.7	3	116 0	8	113.4	2.11	8.8
	1	107.0	1	107.0	—	—	–	—	2	106.0	—	—
17	–	—	4	139.4	1.73	5.1	1	136.0	7	125.9	2.00	7.8
	–	—	–	—	—	—	–	—	2	121.5	—	—
48	–	—	6	69.6	1.11	4.0	1	60.0	8	68.6	1.59	6.6
	1	66 0	–	—	—	—	–	—	1	62.0	—	—
45	–	—	6	124.4	1.33	4.8	2	135.5	8	129.8	1.72	7.2
	–	124.0	1	113.0	—	—	–	—	1	125.0	—	—
55	–	—	6	48.8	0.99	3.5	1	49.0	8	52.3	0.84	3.5
	1	46.0	–	—	—	—	–	—	1	48.0	—	—
54	–	—	6	24.9	0.51	1.8	1	26.0	8	26.1	0.41	1.7
	2	22.0	–	—	—	—	–	—	1	24.0	—	—
I 1	–	—	7	74.1	0.75	3.0	3	78.6	8	79.2	0.80	3.7
	2	72 9	3	78.6	—	—	–	—	4	81.1	0.46	1.4
I 39	–	—	6	56.0	0.72	2.6	1	43.8	8	52.9	1.05	4.4
	1	53.2	–	—	—	—	–	—	1	49.6	—	—
I 48	–	—	6	51.3	1.89	6.3	1	53.1	8	50.2	1.07	4.5
	1	47.8	–	—	—	—	–	—	1	50.0	—	—

Mean SD. for male skulls is 4.2 for the Copper Age, and 5.6 for the Hittite Period. I explain this different value by tho facts: (a) the brachycephalization which changed, even slightly, the fundamental uniformity; (b) the eventual penetration of foreign elements in the community during the last centuries of the so-called Hittite Period (ca. 2000 - 1200). Obviously the above figures are only indications of the independent homogeneity of the two series or indices of their somatic uniformity. What it is necessary is to ascertain whether these skulls are different in their somatic characteristics. The result of my calculation answers "no" to this question. In fact: (a) comparing the values of the two series against the corresponding values of the Anatolian male Type all the 22 values fall within the field of $A \pm 1\sigma$, with the exception of one $A \pm 2\sigma$; (b) test-

ing the values of both series, one against the other, within the limits of the field of the theoretical mean:[1] I had the following result: all the values but one of the Copper Age skulls are included in the field of the Recent Bronze Period skulls, and the values of these sku'ls fall withing the field of the corresponding means of the Copper Series (with three exceptions); (c) ascertaining with the Student's t-test the level of the actual differences of mean of the two series of skulls. Of 15 differences, 13 are "not significant", i.e. 86.7 %, which is a very good figure. I conclude: (1) that the head has maintained the length form, while the parietal bones are mm 9.6 distant from each other, thus affecting the cranial index; (2) that the morphoarchitecture is practically the same after nearly a millennium; (3) that all the elements above mentioned prove the continuity of the same population *in situ* from the Late Neolithic up to the beginning of the Iron Age including therefore the so-called Hittite Period.

Summarizing, there have been found in this settlement of Alişar the skeletal remains of the early population, i.e. the Late Neolithic, then of Copper Age Man, of the Bronze Age and of the Hittite Period. During more than two millennia these remains show us the slow morphological evolution and the growing tendency to brachycephalization.

It is difficult and controversial to date the skulls more than approximately, but I classed them tentatively unsexed in the following three groups in order to obtain some comparative values during the period of more than two millennia: (a) Late Neolithic and Copper Age, 3500 - 2400; (b) Early Bronze Age, 2300 - 2000; (c) Recent Bronze Period, 1900 - 1300. I calculated some constants for these three groups, and I listed them on next page.

These figures indicate a constant and regular decrease of the somatic uniformity, even if this reduction is fairly small. The maxi-

[1] There is a very useful index of dispersion, "the oscillation field of the theoretical mean". The narrower the field is, the more the two means (theoretical and observed) meet each other or coincide. This field is formed by adding to or substracting from the value of the arithmetic mean (A) the value of three times its probable error (PE), i. e A $\pm$ 3PE. The theoretical mean has a probablitiy of 95 % to fall within these limits, and conversely, the observed mean has the same probability to fall into an interval of 3PE over or under the theoretical mean. I have called this field, for the sake of brevity, delta (Δ).

mum length practically has not changed during the more than two millennia, while the maximum breadth shows an increase of 9 mm. affecting evidently the cranial index. The auricular height has changed only by half a millimeter, but the other vault height –basibregmatic– shows a decrease of mm. 11.6. Evidently the forces involved in the adjustment process derived from the constant broadening of the head, have certainly affected the basal portion of the occipital bone. The upper height of the face is practically the same, while the maximum breadth–bizygomatic br.– has increased by 6 mm., and the resulting upper facial index is the same or nearly so. A similar aspect reveals also the nasal index and its two component terms.

(a) group 3500 - 2400 12 skulls			(b) group 2300-2000 3 skulls		(c) group 1900-1300 12 skulls		(a)			(b)		(c)	
M	A	SD.	A	SD.	A	SD.	M	A	SD.	A	SD.	A	SD.
1	181.1	6.4	180.5	7.8	180.5	8.0	55	48.4	2.5	49.0	—	51.8	3.6
8	134.6	4.4	142.5	5.0	143.6	5.5	54	24.4	2.5	26.0	—	25.9	1.7
20	111.4	3.6	116.0	4.2	111.9	9.0	I 1	75.1	2.9	78.6	4.0	79.9	3.1
17	136.4	5.1	136.0	—	124.9	7.1	I 39	55.3	2.5	44.0	—	52.8	4.2
48	69.1	3.7	60.0	—	67.9	6.4	I 48	50.9	5.9	53.0	—	50.2	4.4
45	123.0	5.6	135.5	2.2	129.2	6.9							

The SD. means are : (a) group 4.1; (b) group 4.6; (c) group 5.4.

I give in the next table the data and the essential constants of the skulls of Alişar grouped together in a single pool but separated according to sex.

The "intra"-index is 4.8 (that of the Anatolian Type is 4.5) and the "inter"-index is the highest in the range of this index- 94.4. This position among the Anatolians is confirmed by the fact that the measuments of the 11 essential characters fall within $A \pm 1\sigma$.

M	N	A	±	SD.	M	N	A	±	SD.	M	G	A	±	SD.
1	16	182.3	1.18	7.0	51a	14	39.4	1.05	5.8	I 4	16	62.3	0.61	3.6
	5	175.8	1.33	4.4		3	37.3	—	—		4	60.9	1.58	4.7
5	12	102.7	1.37	7.0	52	15	33.1	0.66	3.8	I 5	16	78.2	0.94	5.5
	1	87.0	—	—		3	33.0	—	—		4	78.4	1.85	5.5
8	16	140.8	1.13	6.7	54	15	25.6	0.31	1.8	I 13	16	68.7	1.06	6.3
	5	138.0	2.02	6.7		2	23.0	—	—		5	69.2	2.31	7.7
9	16	96.7	0.98	5.8	55	15	50.6	0.66	3.8	I 37	12	151.1	1.31	7.3
	5	95.5	2.60	8.7		2	47.0	—	—		2	145.1	—	—
17	10	133.0	1.24	5.7	60	9	50.4	1.13	5.0	I 39	15	53.5	0.75	4.3
	1	127.0	—	—		1	43.0	—	—		2	51.4	—	—
20	16	113.5	1.08	6.4	61	12	60.8	0.84	4.3	I 42b	14	84.3	1.00	5.6
	4	106.5	1.92	5.7		2	61.0	—	—		3	88.4	—	—
40	12	94.8	1.41	7.2	I 1	18	77.1	0.64	4.0	I 48	14	50.0	0.76	4.2
	1	77.0	—	—		9	78.4	0.83	3.7		2	48.9	—	—
45	14	128.3	0.99	5.5	I 2	12	71.3	1.07	5.5	I 54	9	120.6	0.99	4.7
	3	120.6	—	—		2	70.4	—	—		1	141.9	—	—
48	14	67.6	0.90	5.0	I 3	12	92.0	1.61	8.3	I 60	12	88.1	1.39	7.1
	2	64.0	—	—		2	86.1	—	—		1	88.5	—	—
49a	13	24.1	1.52	8.2						I 71	16	91.3	0.65	3.8
	2	21.5	—	—							3	89.7	—	—
										I 73a	16	75.7	0.62	3.7
											3	77.7	—	—

SCHAEUBLE'S DATA

The data on the skeletal remains of the population of Boğazköy (Osmankayası) were given by the German anthropologist Schaeuble, and they are very reliable. These data are important because: (a) they refer to a fairly large series of remains; (b) these remains represent one of the settlements of the Central Plateau where the capital of the Hittite Empire stood; (c) they permit an adequate comparison with coeval or nearly coeval (1900 - 1400 B. C.) series or single skulls of other Anatolian local Types. Among these the series of Recent Bronze Age skulls of Alişar is very important because it is relatively large and the cranial measurements were given by another eminent anthropologist, Krogman.

The period I considered, i. e. that covered by Schaeuble's data, includes six settlements, two of which (Osmankayası and Alişar)

belong to the so-called Hittite Plateau, and the other four (Hisarlık, Kum, Kusura, Polatlı) to various regions of Anatolia, some very far from the Central Plateau. The comparisons (for the sake of brevity I omit the tables of data) pertain to 34 skulls, for which, in addition to other tests I calculated 71 differences of mean, 66 of which (92.8 %) are "not significant". Such a high level of somatic homogeneity shows, even in the II millennium B.C., the lack of any genetic intrusion in the Anatolian Proto-Mediterraneans.

Analysing these mutual comparisons I find that the intergroup index of somatic variability varies in some degree from the lowest –84.21– to the highest –100.00–. Three of them are extremely high (Kum 100.00, Alişar 97.37, Kusura 96.97), three other between the figures of 80.0 and 90.00 (Osmankayası 86.96, Polatlı 85.71, Hisarlık 84.21).

The Problem Of The Hittite

There is a theory affirming that the Hittite Civilization is the product of the high developed culture of rather a small population extraneous to the genetical Type of the Anatolian Proto-Mediterraneans. Such a theory is very elaborate, as it involves the hypothesis of a very long mass migration of a compact group of tribes from very distant regions up to the Central Plateau, through difficult and tortuous routes. It is an archaeologists and ethnologists' theory supported by cultural elements and pottery comparisons, to which the physical anthropologists give less importance. The many remains of this civilization, particularly the archaelological ones, show a distinctive cultural stage of high level, which compares favourably with the coeval or nearly coeval civilizations of the Mediterranean as the Egyptian, the Minoan, the Sumerian and the Harappan. The function of the ruling caste was very advanced, so were military affairs, political organization, legislation and justice; more backward were religion and literature.

However we must remember that it is a rather recent civilization, as its summit can be dated about 1500 B.C. and the beginning of its development to about 1700. From 1500 this civilization declined more and more and dwindled away at about 1200 B. C. In my opinion it is essentially the result of a slow progression of cultural achievements, a constant developing of elements at higher and higher levels. Therefore it is not necessary to attribute it to another genotype.

The Hittite term is to be taken as representing only a complex of cultural elements (linguistic, religious, social, etc.) and not as a distinctive genetic division of the Anatolian population of the period covered by my study. My thesis is supported by the anthropometric data which show no significant differentiation among the various local Types and no special aspect of the populations of the so-called Hittite region in the Northern Plateau. I cite only the populations which have left skeletal remains, as Büyük, Osmankayası, Alaca, and Alişar. I have already given some essential data of these four populations and shown as they appear randomized samples of the Regional Type. The inter-group index of somatic variability of these four populations is 85.4, a very good figure indeed. I have calculated 387 differences of mean of eleven characters for them: of ten differences 8.5 are "not significant". Then practically they are alike and in agreement with the Anatolian Type. The Sigma-test coincide of course with such a result. Of 33 mean figures, 27 fall within $A \pm 1\sigma$, and 6 within $A \pm 2\sigma$.

Discussion And Analysis Of The Results

I considered only adult skulls belonging to the 14 populations as already dealt with, i.e.

	♂	♀	T		♂	♀	T		♂	♀	T
Polatlı Höyük	2	–	2	Büyük Güllücek	1	–	1	Babaköy	1	–	1
Ahlatlıbel	5	–	5	Osmankayası	9	7	16	Kumtepe	1	3	4
Yümüktepe	1	2	3	Alaca Höyük	6	5	11	Hanaytepe	3	11	14
Şeyh Höyük	2	3	5	Alişar Höyük	19	9	28	Hisarlık	7	5	12
Tilkitepe	5	7	12					Kusura	4	1	5

Total 119 (66 ♂, 53 ♀)

These 119 skulls could be assigned to a period from the Late Neolithic up to the beginning of the Iron Age, i.e. approximately from 4000 to 1500 B.C. I attributed them very tentatively as follows: 11 to the Late Neolithic, 53 to the Copper Age, 22 to the Early Bronze Age and 33 to the Recent Bronze (so-called Hittite Period). From these figures we see that more than half (64) of the total are very old, belonging to a period from 4000 to 2400, in which only five

of them are brachycephalic. Then, during the course of time, the biological evolution towards broad heads influenced more and more their morphological structure, with larger percentages of meso– and brachycephalics. Of the total the dolicho- represent 43.4 %, the meso– 36.3 %, and the brachycephalics 20.3 %.

As already mentioned, for each skull series I have indicated the level of their phenotypical uniformity and calculated their intra-group index of somatic variability. Then, taking them as randomized samples of the whole Anatolian Population, I have fixed the indices of their inter-group variability. In the next pages I shall give more details on this analysis. Before it I give here below the inter-sex values of the constants for the eleven essential characters I consider for the total group of skulls of the Anatolian Type.

M	N	A	SD.	M	N	A	SD.	M	N	A	SD.	M	N	A	SD.
1	109	182.8	7.3	17	40	133.6	5.4	55	42	50.0	3.4	I 1	113	76.0	4.4
8	109	136.7	6.1	48	43	67.1	4.0	54	45	24.6	1.8	I 39	42	53.3	3.7
20	74	112.5	5.7	45	50	126.0	4.6					I 48	39	48.7	3.6

SD. mean 4.5

Only for a few skull series was I able to calculate "unreserved" intra-indices (i.e. series which had the values of measurement for all the 11 essential characters) and these are: Tilki-intra-index 1.8, Alaca-3.5, Şeyh-4.1, Kusura-4.2, Alişar 4.8, Hisarlık-5.4. Six other skull series permit only "limited" indices, i.e. series in which some measurements have the relative values; their indices cannot be correctly compared with the other six previously indicated. These are Polatlı-2.9, Ahlatlı-3.3, Hanay-4.7, Osman-6.3, Kum-7.7, Yümük-8.5

But referring to comparisons, how can it be known whether the figures of these intra-indices reveal great or little somatic homogeneity? They must then be compared with some reliable inter-racial series of SDs. We can use those calculated by Hambly (Wilfrid D. Hambly, Craniometry of Ambrym Island, Fieldiana Anthropology, vol. 37, No. 2, Chicago, 1946). I have calculated from his data an inter-racial index (inter-sex) taking into account series of skulls of

Egyptians, Old Lachish skulls of Palestine, and Hisar skulls, all coeval or nearly coeval with these Anatolian skulls. The values I obtained for the 11 characters I normally consider are :

M 1-5.5, M. 8-4.6, M 17-5.0, M 48-4.1, M 45-4.7, M 55-2.7, M 54-1.6, I 1-2.7, I 39-4.7, I 48-4.5. Mean value 4.0. There is no value for M 20 or 21 as Hambly has not given the values for the vault height.

According to these figures we can assume as exceptionally uniform the skulls of Tilki and Alaca followed in progression by those of Şeyh and Kusura which all are $\leqslant$ of the mean-value of my comparison list (4.0). The Alişar skulls are less homogeneous, and even less those of Hisarlik. I can try, also with some reserves, to compare the values of the other six series for which I have only "limited" intra-indices. Comparing only the characters "measured" the indices are: Ahlatlı-2.6, Polatlı-3.7, Hanay-4.7, Osman-5.5, Kum-7.7, Yümük-8.5, the comparative mean-value being 4.0. We can assume, though partially, that Ahlatlı and Polatlı skulls are very homogeneous and that the Osman ones are less uniform, and even less the Yümük skulls.

Is there a reason for such a lack of uniformity? The problem is very difficult or, rather, it has more than one solution. My opinion is as follows: (a) in general the greatest somatic homogeneity is shown by small series of skulls, which normally indicate a small population. The smaller the population is, the more isolated it is; consequently the phenotypic variability is reduced. This, more or less, clears up the figures of Tilki, Ahlatlı, Polatlı, and Şeyh. The geographical position of these settlements corroborates in some way my thesis. Tilki is by Lake Van, at the most eastern side; Ahlatlı and Polatlı are in the Central Plateau, and Şeyh is by the Alexandretta Gulf in the southeastern corner of Anatolia. Alaca, being one of the so-called Hittite settlements on the Central Highland, should have shown the same somatic aspects, i.e. (a) a minor homogeneity; (b) the lesser values of Kum and Hisarlık are due (as they belong to the Troad group) to the precocious rise of the brachycephalization which has influenced the cranial morphoarchitecture; (c) the case of Osmankayası has another basis: the skeletal remains, though Schaeuble's examination has been very diligent were in such a bad condition that the measurements were unsatisfactory. On the other hand we

know that the remains were dated to about 1550 B.C. when undoubtedly the original community had received many foreign elements and had lost its intrinsic homogeneity.

As we have seen six settlements (Kum, Baba, Ahlatlı, Büyük, Polatlı, Yümük) which are represented by one or by very few skulls each, do not permit the normal biometrical calculations and consequently no "unreserved" intra-indices. I pooled these skulls together forming a single series which thus permits calculation of the constants. I have indicated them here below :

M	N	A	SD.	M	N	A	SD.	M	N	A	SD.	M	N	A	SD.
1	14	189.0	6.4	17	5	139.6	4.2	55	1	50.0	—	I 1	14	73.1	3.3
8	15	137.3	6.0	48	1	69.0	—	54	1	23.0	—	I 39	1	54.8	—
20	10	116.9	2.1	45	3	131.3	—					I 48	1	46.0	—

The values fall within the limits of the Anatolian Type $\pm 1\sigma$, with one exception (basibregmatic height) falling into $A \pm 2\sigma$. Thus it is confirmed that all these skulls, either individually or in a pool of 16, are to be considered as casual samples of the whole population.

The inter-group variability is based on the differences between each somatic value of a population and the same one in succession of all the other populations of the 14 settlements, and reciprocally. These differences of mean being "not-significant" or "significant" indicate whether the two values of the character considered are "similar". We assume than consequently the identity of the genotype.

I calculated 1271 differences of mean, 83.3 % of which were "not-significant"; such a high figure supports my thesis which assumes the Anatolian population of the Late Neolithic and Chalcolithic times to be a homogeneous Branch of the Asian Proto-Mediterraneans. Of course the somatic similarity is represented by a sinuousdal trend because each character shows a different level in each series, as some characters are subjected to a greater variability or rather, they show distinct levels in the 14 populations. The values of some characters are remarkably similar. For instance there are slight differences for the upper facial height and that means that all these 119 skulls show no relevant variation for such measurement.

The same high degree of similarity is shown for the nasal index (95.7) and the upper facial index (95.2), the nose height (90.9) and the breadth of the apertura piriformis (87.5), the maximum breadth (92.2). Some characters show less similarity: auricular height (81.9), cranial index (78.9), basibregmatic height (68.9).

Now I give the values of the constants for the pooled 119 skulls forming the Regional Type of Anatolia, distinct by sex :

M	N	A	±	SD.	M	N	A	±	SD.	M	N	A	±	SD.
1	62	184.8	0.69	8.0	48	32	68.0	0.52	4.4	I 1	63	76.0	0.37	4.3
	47	180.2	0.64	6.2		11	64.6	0.61	3.0		50	76.1	0.47	4.8
8	62	140.5	0.48	5.5	45	33	129.5	0.54	4.6	I 39	31	53.2	0.45	3.7
	47	131.6	0.71	7.0		17	119.3	0.82	5.0		11	53.8	0.83	4.1
20	51	113.9	0.55	5.8	55	31	50.9	0.44	3.6	I 48	28	48.3	0.52	4.1
	23	109.3	0.80	5.7		11	47.5	0.59	2.9		11	49.7	0.39	1.9
17	33	134.0	0.62	5.2	54	32	25.0	0.23	1.9					
	7	132.0	1.45	5.7		13	23.5	0.32	1.7	SD. mean ♂ 4.6, ♀ 4.4				

In the previous pages, for each settlement I have indicated the result of the checking of the single measurements by Sigma-test against the corresponding values shown by the Anatolian Type. To summarize I state that all the values for the 11 essential characters of these 119 skulls fall under the frequency curve of the Anatolian Type$\pm 3\sigma$. It is remarkable that more than 85 % of the cases fall within the limits A$\pm 1\sigma$, and therefore they practically can be considered similar to the Type.

I have established a final analysis on the basis of the division of these Anatolian skulls into four groups of Local Types having regard to some ethnogeographical elements. A first group, that I call "Troad" is composed with the settlements established in the Western region of Anatolia (Baba, Kum, Hanay, Hisarlık). Many important elements show that the Troad Region can be identified with a state known to the Hittite scribes as Aššuwa in which the position of Troy as urban centre, whether asoociated or not, is completely unknown to us. Certainly it was a region extending approximately from the river Meander (present Menderes) in the south to the Hellespont and Sea of Marmore in the north, and limited to the east by the debatable frontiers of Arzawa, which was a large independent

state in Hittite times. This of course is an outline for the period of the Recent Bronze as we have no written evidence for the Copper Age. It seems that from the earliest times the inhabitants of the Troad settlements developed idiosyncrasies and affiliations which segregated them from eastern part of Anatolia. Their cultural orientation was towards the Aegean islands and Aegean Sea and not with the interior of the land. Among them the process of brachycephalization assumed a strong development being, in addition, very early (about the middle of the IV millennium). This influenced, even slightly, the elements of the cranial morphoarchitecture which reveals a lack of uniformity through the rather elevated SD. figures.

The second group I formed is composed with the skulls of the populations of Polatlı, Ahlatlı, Yümük, Şeyh and Tilki. They cover practically all the southern and eastern regions of Anatolia and partially the Central Plateau. These populations appear sparse, rather isolated, very far from one another. These elements influenced their somatic variability, a variability indeed very moderate due to endogamy and segregation. On the other hand, their relative isolation has contributed to differentiate them from the Troad group and from the group of the so-called Hittite Province, in relation to the inter-group indices of somatic variability.

A third Group - up now a single population, Kusura - represents a link between the Troad Region and the populations of the other parts of Anatolia. In fact its SD. mean is very near to the latter, but shows a tendency with its cultural elements to the Troad Region.

The fourth Group I formed is composed with the populations of Büyük, Osman, Alaca, and Alişar. These settlements cover the central part of the Anatolian Plateau, a region between the rivers Kelki and Kızıl, that I have called for the sake of brevity "Hittite Region" as there was located the capital (Hattusa) of the Hittite central government. The most important series of skulls is that of Alişar which represents very vividly the real aspect of the morphology of its population from the Late Neolithic up to the beginning of the Iron Age. On the other hand the series of Osmankayası skulls after Schaeuble's investigation represents the same Type for the only period of the Recent Bronze. I summarize this analysis tentatively with the following data :

	Populat.	Skulls	SD.	"Inter"-index
Troad Region Group	4	31	5.9	82.4
Other Regions Group	5	27	4.1	76.8
Kusura Region Group	1	5	4.2	92.5
Hittite Region Group	4	56	4.9	85.9
Anatolian Regional Type	14	119	4.5	83.3

In order to outline summarily the Anatolian Regional Type I indicate in the following table the most important elements and final figures of my analysis. I assume, with much caution, the following date equivalence for the terms I use in this table :

(a) Late Neolithic : approximately 4000 - 3000 B. C.
(b) Copper Age: approximately 3000 - 2350 B. C.
(c) Early Bronze Age: approximately 2350 - 2000 B. C.
(d) Recent Bronze Age or so-called Hittite Period: approximately 2000 - 1300 B. C.

That is :		N	%
Late Neolithic	(5 Şeyh skulls, 2 Alişar, 1 Büyük, 1 Tilki, 1 Hisarlık, 1 Kum).	11	9.32
Copper Age	(11 Alaca skulls, 11 Tilki, 10 Alişar, 5 Ahlatlı, 5 Hisarlık, 3 Yümük, 3 Kusura, 3 Kum, 1 Baba, 1 Polatli).	53	44.50
Early Bronze	(14 Hanay skulls, 5 Hisarlık, 3 Alişar.)	22	18.48
Recent Bronze	(16 Osmankayası skulls, 13 Alişar, 2 Kusura, 1 Polatlı, 1 Hisarlık).	33	27.70
		119	100.00

Skull - Series	N	Inter sex mean SD.	♂ mean SD.	♀ mean SD.	Inter-group index somat variab.	Intersex cranial index
Alişar						
Pooled series of skulls (4000 - 1300)	28	4.8	4.9	3.7	94.4	77.4
Late Neolithic skulls (4000 - 3000)	2	0.4	—	0.4	—	72.9
Copper Age skulls (3000 - 2350)	10	4.2	4.2	1.1	—	75.4
Early Bronze skulls (2350 - 2000)	3	4.7	4.7	—	—	78.6
Recent Bronze skulls (2000 - 1300)	13	5.4	5.6	5.8	—	79.9
Osmankayası						
Recent Bronze skulls (2000 - 1300)	16	6.3	6.8	5.1	75.3	78.4
Hanay						
Early Bronze skulls	14	4.7	3.6	4.4	68.3	74.8
Tilki						
Pooled series of skulls (4000-2350)	12	1.8	7.3	2.0	65.8	76.4
Late Neolithic skull	1	—	—	—	—	82.3?
Copper Age skulls	11	1.9	7.2	2.1	—	75.9
Hisarlık						
Pooled series of skulls (4000 - 1300)	12	5.4	4.7	5.6	93.5	76 4
Late Neolithic skull	1	—	—	—	—	65 5
Copper Age skulls	5	4.4	6.4	2.5	—	76.0
Early Bronze skulls	5	5.5	5.6	—	—	76.6
Recent Bronze skull	1	—	—	—	—	88.2
Alaca						
Copper Age skulls	11	3.5	4.5	1.0	82.6	79.1
Şeyh						
Late Neolithic skulls	5	4.1	2.6	3.4	84.3	69.3
Kusura						
Pooled series of skulls (3000 - 1300)	5	4.2	4.1	—	92.5	76.3
Copper Age skulls	3	4.1	4.1	—	—	73.8
Recent Bronze skulls	2	6.7	6.7	—	—	79.9
Ahlatlı						
Copper Age skulls (3000 - 2350)	5	3.3	3.3	—	67.2	76.2
Kum						
Pooled series of skulls (4000 - 2350)	4	7.7	—	6.9	77.6	76.2
Late Neolithic skull	1	—	—	—	—	81.0?
Copper Age skulls	3	6.9	—	6.9	—	73.9
Yümük						
Copper Age skulls	3	8.5	10.3	10.3	78.8	69.0
Polatlı						
Pooled series of skulls (3000 - 1300)	2	2.9	3.0	—	87.9	73.3
Copper Age skull	1	—	—	—	—	72.5
Recent Bronze skull	1	—	—	—	—	74.2
Büyük Güllücek						
Late Neolithic skull	1	—	—	—	91.2	70.9
Baba						
Copper Age skull	1	—	—	—	90.3	72.7

Addendum

I could not incorporate in my study the data regarding the skulls indicated here below, because I received a report on them after the final compilation. I list these remains distinctly by settlement, name of the anthropologist who has studied and measured them, and date.

Settlement	Anthropologist's name	Approx.date	Adult skulls	Total
Evdi Tepe	Çiner	3000 - 2000	1 ♀	1
Müskebi	do	II millennium	2 ♂ 1 ♀	3
Altıntepe	do	8000 - 7000	1 ♂ 1 ♀	2
Acem Höyük	do	2000 - 1750	1 ♀	1
Alaca Höyük	Tunakan	2400	1 ♂ 1 ♀	2
				9

These settlements are rather spread all over Anatolia and the remains belong to the period covered by my study. The values of their essential characters fall within the limits of Mean$\pm 3\sigma$ of the Anatolian Type, and therefore they form undoubtedly randomized samples of the Anatolian Proto-Mediterraneans.

As it was not possible to calculate the constants for the skulls of each settlement (too few), I pooled them together obtainng a series of 9. I indicate on the next page the biometrical constants for some essential characters I could calculate.

I calculated for eleven essential characters (as normally I did in my study) the intersex values of the constants I listed them on the next page.

All these values fall within the limits of the mean $\pm 1\sigma$ of the Regional Type, with exception of the auricular height (A$\pm 2\sigma$). This fact corroborates once more my thesis on the unitarian homogeneity of the Anatolian Proto-Mediterraneans represented by the skeletal remains I mentioned in my study.

More particularly I observe that the two new skulls of Alaca Höyük when compared with the other eleven of the same settlement

M	N	A	M	N	A	M	N	A
1	4	187.0(a)	48	–	—	I 2	3	76.0
	4	179.0(b)		1	69.0		1	72.3
5	1	127.0	51a	–	—	I 3	2	96.2
	1	100.0		1	36.0		1	96.2
8	3	144.7	52	–	—	I 4	4	65.7(h)
	5	134.8(c)		1	36.0		3	66.0
9	2	104.0	54	–	—	I 5	3	84.9
	2	96.5		1	26.0		3	88.3
10	1	110.0	55	–	—	I 38	–	—
	1	115.0		1	52.0		1	83.2
17	3	140.3	60	–	—	I 39	–	—
	1	128.0		1	50.0		1	55.2
20	4	122.5(d)	61	–	—	I 42b	–	—
	4	116.5(e)		1	56.0		1	92.3
23	2	545.0	66	2	100.0	I 48	–	—
	4	506.5(f)		1	98.0		1	50.0
45	–	—	I 1	3	76.2	I 54	–	—
	1	125.0		4	76.1(g)		1	112.0

(a) σ 10.7; (b) σ 2.1; (c) σ 4.7; (d) σ 5.4; (e) σ 5.8; (f) σ 7.0; (g) σ 2.4; (h) σ 5.1.

(vide 370-371 p.) show a certain degree of variability for some cranial traits, though within the limits of A $\pm 3\sigma$. Of the few essential characters which could be checked, two values fall within the limits of A$\pm 1\sigma$, and two within A$\pm 2\sigma$. Both male and female values of the cranial index are rather close to the mean value of the eleven skulls and fall within the limits of A$\pm 1\sigma$.

M	N	A	SD.	M	N	A	SD.	M	N	A	SD.
1	8	183.0	8.3	17	4	137.3	8.6	54	1	26.0	—
8	8	138.5	7.7	48	1	69.0	—	I 1	7	76.2	5.3
20	8	119.5	6.1	45	1	125.0	—	I 39	1	55.2	—
				55	1	52.0	—	I 48	1	50.0	—

The differences of mean between these nine skulls and the coeval ones mentioned in my study, are nearly all "not significant". For

instance, the values of Tunakan's skulls checked against the coeval Alaca series of five give a value of P 0.30 for the male skull and 0.19 for the female one for the maximum breadth, and respectively 0.45 and 0.87 for the cranial index. The very old date of Çiner's Altın skulls excludes them from my study, and I could only tentavively compare them with the oldest skulls, in number of 2 orthan 2, mentioned in my study, i.e. five Şeyh skulls of Late Neolithic and two similar ones from Alişar. Nearly all the differences of mean are "not significant". So, for instance, the values of P are respectively for the male and female skull 0.44 and 0.50 for the maximum length; 0.80 and 0.38 for the maximum breadth; 0.16 and 0.08 for the cranial index; for the only female skull P is 0.32 for the auricular height. I remind "*ad abundantiam*" that I use the probability level of sig nificance at 5 % (P 0.05).,

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Yazının içindeki başlıca konular:

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Önsöz. – Çalışma tekniği üzerinde Notlar.

Anadolu'lu Akdeniz–Öncesi insanları.

Anadolu'lu bölgesel tip.

Verilerin biyometri bakımından işlenmesi.–Değişkenlikler.

Brakisefal'leşme sorunu.

Yerleşmeler ve iskelet kalıntıları :

1. Babaköy, 2. Kumtepe, 3. Hanaytepe, 4. Hisarlık, 5. Kusura, 6. Polatlı Höyük, 7. Ahlatlıbel, 8. Yümüktepe 9. Şeyh Höyük, 10 Tilkitepe, 11. Büyük Güllücek, 12. Osmankayası, 13. Alaca Höyük, 14. Alişar Höyük.

Schaeuble'in verileri.

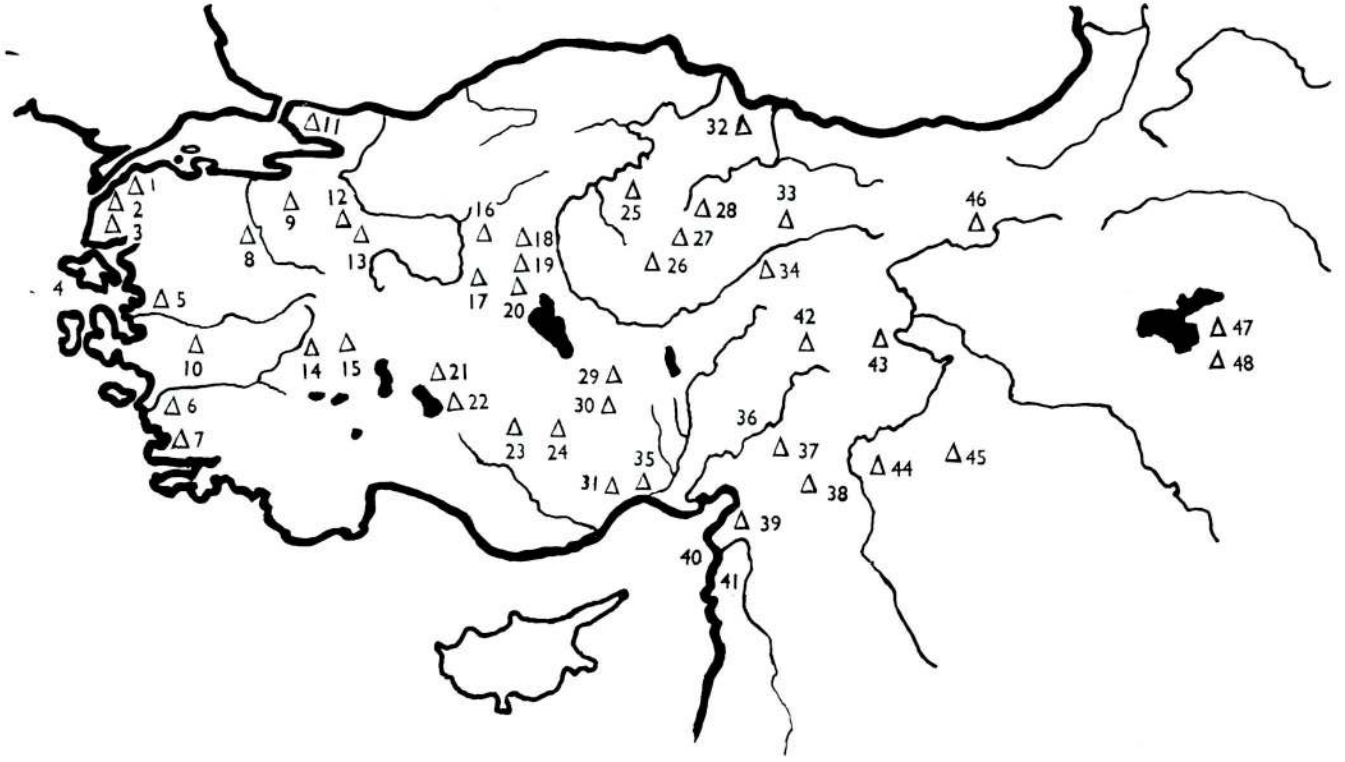
Hittit'ler sorunu.

Tartışma ve sonuçların analizi.

Katkılar.

Diyagram vb.

Geniş bir bibliyografya.

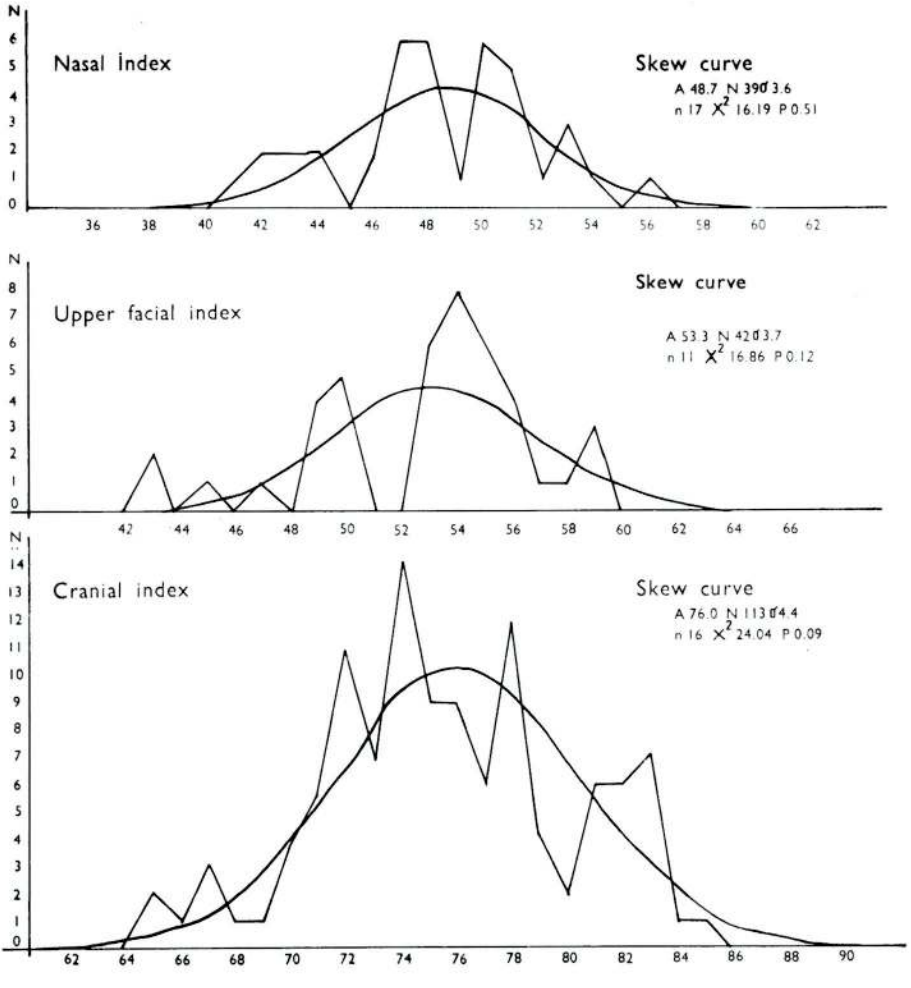


ANATOLIA

Map showing the most important archaeological places of Late – Neolithic, Chalcolithic, and Bronze times.

List of the Settlements of the Late Neolithic and Chalcolithic times considered in my Study and indicated by numbers on this Map :

1 — Kumtepe
2 — Hisarlık
3 — Hanaitepe
4 — Thermi
5 — Sipylos
6 — Miletus
7 — Müskebi
8 — Yortan
9 — Babaköy
10 — Karabel
11 — Fikirtepe
12 — Boz Höyük
13 — Demirci Höyük
14 — Beyce Sultan
15 — Kusura
16 — Etiyokuşu
17 — Polatlı Höyük
18 — Ahlatlıbel
19 — Karaoğlan
20 — Gâvur Kalesi
21 — Eflâtun
22 — Fassiler
23 — Karadağ
24 — Ibrizdağ
25 — Büyük Güllücek
26 — Bogazköy - Osmankayası
27 — Pazarlı
28 — Alaca Höyük
29 — Acem Höyük
30 — Bor
31 — Yümüktepe
32 — Dündartepe
33 — Alişar Höyük
34 — Kültepe
35 — Tarsus
36 — Karatepe
37 — Sincirli
38 — Sakçegözü
39 — Tell-al-Judaidah
40 — Atchana-Alalakh
41 — Şeyh Höyük (Tell eş - Şeyh)
42 — Kara Höyük
43 — Arslantepe
44 — Gargamish (Kargamış)
45 — Sultantepe
46 — Altıntepe
47 — Tilkitepe
48 — Toprakkale


N
Nasal index
Skew curve
A 48.7 N 390 ơ 3.6
n 17 X² 16.19 P 0.51
36 38 40 42 44 46 48 50 52 54 56 58 60 62
N
Upper facial index
Skew curve
A 53.3 N 420 ơ 3.7
n 11 X² 16.86 P 0.12
42 44 46 48 50 52 54 56 58 60 62 64 66
N
Cranial index
Skew curve
A 76.0 N 113 ơ 4.4
n 16 X² 24.04 P 0.09
62 64 66 68 70 72 74 76 78 80 82 84 86 88 90