

## VII.

### ON THE BONES FROM GRAVES AT ACKERGILL, CAITHNESS, AND AN UNDERGROUND BUILDING AT RENNIBISTER, ORKNEY. BY PROFESSOR THOMAS H. BRYCE, M.D., F.R.S., F.S.A.Scot.

This paper deals with two collections of human bones from the North of Scotland. The first series came from the graves at Ackergill, Caithness, excavated by Mr Edwards in 1925 and 1926, and the second series from the underground building at Rennibister, Orkney, described by Dr Hugh Marwick in the present volume of the *Proceedings* of the Society.

In neither case do the bones date from remote prehistoric times. The Ackergill graves have been shown by Mr Edwards to belong to the Viking period. The underground structure at Rennibister is probably of an earlier date, although it might have been occupied at any time during a long series of centuries.

The skull and long bones from the two collections closely resemble one another and clearly represent the same physical type. Taken together, they provide data regarding the physical characters of the population of the extreme North of Scotland in these early times.

In excavating the Ackergill graves Mr Edwards was careful to identify and keep together the parts belonging to each individual skeleton, and as they had been buried in sand they are, generally speaking, in rather better preservation than is commonly the case with bones recovered from ancient graves in this country. The skeletons, however, are far from complete. Parts are entirely missing, and many of the bones actually present are imperfect, due to portions being decayed away. In

the majority of cases, however, the bones most important for a reconstruction of the physical characters of the people have been preserved. The collection represents the remains of fourteen individuals. One of them was an infant, a second a child of about eight years, a third a young person of fifteen or sixteen, while the remaining eleven persons were adults ranging in age from about twenty-one years to old age.

The Orkney bones were hopelessly mixed and the collection is thus less valuable. The mixture was due to the circumstances in which they were found. But the fact that several of the skulls had been placed base upwards, side by side, round the foot of one pillar, showed that this was no undisturbed original interment. The great mass of the bones are those of children ranging from five to sixteen years of age. There must have been at least twelve, perhaps thirteen, of these young people. There are, however, only ten young skulls, or parts of skulls, in the collection. The adult bones are fewer in number. There are six skulls, three of which, from their sex characters, I identify as male and three as female. In the absence of the corresponding pelvic bones there is always some doubt regarding the sex of skulls in which the differentiating sex characters are not pronounced. In two specimens of this series this is the case, but I have finally, as indicated, placed one of them among the male, the other among the female skulls. The long bones are very few in number, and I cannot account for this in view of the large number of young bones. There are only three thigh bones and four hip bones, two of which form a pair, and are male, while the other two are odd, one being male, the other female.

The immature skeletons do not, from lack of comparative data, furnish information regarding the racial characters of the people. I shall therefore deal only with the bones of the full-grown individuals.

It will be convenient to present the data regarding the bones of trunk and limbs and those regarding the skulls in separate sections.

#### 1. BONES OF TRUNK AND LIMBS.

It will not be necessary to describe each skeleton as a whole, nor to detail all the points on which are founded the conclusions regarding the age and sex of the individuals. It will suffice if I present a table of the measurements of the bones and various figures and indices which show what the bodily proportions of the men and women were. In the case of the Ackergill graves each skeleton is indicated by a letter of the alphabet, which serves to maintain the correspondence between this account and that given by Mr Edwards in his paper. As the bones were kept together we have the data for ten separate individuals. The

skeleton labelled V came from a grave at Reay, described by Mr Edwards, which contained the typical furniture of a Viking burial. It is that of a man, and such data as it yielded are here introduced for comparison with those relating to the skeletons of the Ackergill graves. In the case of the Rennibister bones the data refer only to a series of separate bones, not of individual skeletons, and are so indicated in Table I. Where blanks occur in the table it is to be understood that either the parts of the skeleton were absent or too imperfect for accurate measurement. The stature of the individuals is calculated from the formulæ provided by Professor Karl Pearson. Wherever possible the formula used is that for the stature deduced from the lengths of femur and tibia combined. In the absence of the shin bone the formula is employed which utilises the length of the femur alone in the calculation.

The approximate age of the individuals will be noted in the section upon the skulls.

A general view of this collection of bones produces the impression that the men and women represented were not of particularly robust build. Most of the bones are light and not strongly marked. Moreover, the bones of the limbs are relatively short. The men represented by this small sample were no more, on the average, than about 5 feet 5½ inches, while the women were only about 5 feet ½ inch in stature. The radio-humeral index expresses the relative lengths of forearm and upper arm. The average index corresponds with that given for modern Europeans, and the same is true for the tibio-femoral index which expresses the ratio between the lengths of leg and thigh. The intermembral index, on the other hand, is on the average low. This points, so far as the present small sample is concerned, to a relatively greater length of the arms. In these respects, however, there is little to distinguish this group of bones from a similar random collection of modern bones. There are certain features, however, of the thigh bones and shin bones which at once attracted attention when the collection was viewed as a whole. In the first place, the head and neck of the femur in most of the skeletons is directed forwards to a greater degree than usual. The axis of the head and neck and the transverse axis of the lower articular end of the bone are set at an angle usually a good deal, sometimes a great deal, wider than the average angle in modern bones. No doubt this angle varies a great deal in any series of femora, and no angle recorded for the ancient bones lies outside the limit of variation in recent bones. But the relatively high value of the angle of so-called torsion (over 24°) is noticeable, and strikes the eye of the observer when the series of bones are viewed side by side with a series of recent bones, or with the Reay femora included in this series. This forward direction

TABLE I.

Stature.	metres	1.643	1.645	1.659	1.669	1.649	1.670	1.711	1.697	1.503
	feet	5' 4.7"	5' 4.7"	5' 5.3"	5' 5.7"	5' 4.9"	5' 5.7"	5' 7.3"	5' 6.8"	4' 11.2"
Intermembral Index.		..	69.6	..	73.6	..	..	..	..	..
Femoro-humeral Index.		72	71.5	..	73.9	73.5	71.1	..	77.6	75.7
Tibio-femoral Index.		82.5	81.9	81.3	79.6	..	..	..	..	..
Radio-humeral Index.		..	77.1	..	78.9	80.4	77.6	..	..	..
Angle of Torsion.		25.5°	33°	45°	20°	..	21°	..	..	..
Platycnemic Index.		75	75	64.5	66	..	65	72.4	..	..
Tibia : Length.		363	362	366	363	..	360	..	..	324
Angle of Torsion.		10°	29°	7°	18°	..	31°	16°	7°	18.5°
Platymeric Index.		80	78.7	73.5	74.3	..	67.5	79.4	68.8	65.6
Femur : Max. Length.		440	442	450	456	..	447	456	470	411
Ulna : Max. Length.		..	269	..	291	291	267	..	..	246
Radius : Max. Length.		..	244	..	266	267	247	260	..	226
Humerus : Max. Length.		317	316	..	337	332	318	..	365	..
Scapula { Length. Breadth.		..	..	..	..	..	..	..	..	..
Clavicle : Length.		..	..	..	..	..	..	..	144	145
Os Innominatum { Length. Breadth.		..	..	..	164	224	218	..	..	..
Side.		R.	L.	R.	R.	L.	R.	R.	R.	R.
Pelvis and Index.	108	118	91.5	..	..	..	..	..	..	..
Sacrum and Index.	..	..	..	..	..	114	118.7	..	122	..
Sex.	M.	M.	M.	M.	M.	M.	M.	M.	M.	F.
Ackergill Graves. Skeleton.	B.	D.	G.	J.	M.	O.	V.	F.		
									Mean Stature Male.	
									1.667 ±	9.7
									65.6 ± 0.4	



of the head when well marked is associated with an apparent outward rotation of the upper third of the shaft. In a typical modern bone the convex anterior aspect of the bone is continued up in almost the same frontal plane to the front of the neck, becoming flattened as it rises to the anterior intertrochanteric line, while the inner face of the shaft runs up on to the under aspect of the neck of the bone. In the majority of the ancient bones of this series, when the axis of the lower extremity is held in the frontal plane, the convex anterior aspect of the shaft winds in its upper third lateralwards till it looks outwards, and a strong rounded border or buttress is continued up on the anterior face of the shaft to the under side of the forward directed neck. Further, the twist is associated with an exaggeration of the natural curvature of the shaft, and in its upper part the concavity of this curvature looks inwards as well as backwards. The amount of this apparent twisting round the long axis of the bone varies. In some of the bones it is only slightly marked, but in the majority it is an obtrusive feature. The pair of femora from the Viking grave form a strong contrast in this respect to the majority of the thigh bones in the collection.

The variability of the so-called angle of torsion of the femur is not well understood. It was pointed out long ago by Hultkrantz that the head and neck of the bone had a greater forward inclination in peoples who adopt habitually the attitude of "squatting." The frequency of a high degree of so-called torsion in these ancient Scottish bones therefore invites some further inquiry.

In the "squatting" posture, the hip, knee, and ankle joints are maintained in an acutely flexed position. At both knee and ankle the bones show features which point to adaptations to this position. The head of the tibia is turned backwards a little, and the posterior part of the articular facet on the outer condylar surface is convex, not flat. In none of the bones of this series is there any marked degree of retroversion of the head of the tibia, but the convexity referred to on the articular surface is present in most of the bones. Another feature seen in the shin bones of peoples who habitually adopt the squatting attitude is the occurrence of a facet on the anterior margin of the lower articular surface for the astragalus. In most of the tibiæ in the present collection there are such "squatting facets," although they vary in size. In this collection the so-called angle of torsion of the tibia is in the majority of the bones, whether those of men or women, above, sometimes much above, the average of modern European bones. The so-called angle of torsion varies within very wide limits, for reasons not fully understood, in collections of tibiæ ancient or modern. In the series under examination the angles fall within the limits of variation, as in the case of the

femur, but most of the angles recorded are above the average of modern bones. This is probably to be associated with the high angle of torsion of the femur.

The forward direction of the head of the femur and the excessive torsion of the tibia occurring together in odd bones might be regarded as pathological, as due to a degree of *genu valgum*. Even the facets on the lower articular border of the tibia might have a similar explanation. The fact that the large majority of the bones, both male and female, show these features is distinctly against this solution. The conclusion to be drawn from the study of the bones of these ancient Scottish people is rather that they, like certain of the non-European races at the present day, were accustomed to adopt the attitude of squatting. There is nothing surprising in this if one thinks of the conditions which must have prevailed in these early days, and the low-roofed confined dwellings, such as the Rennibister underground structure appears to be, of certain of the inhabitants.

The femora and tibiæ show other features frequently, indeed generally, seen in ancient bones, viz. an antero-posterior flattening of the shaft of the thigh bone below the trochanters (*platymeria*), and a lateral flattening of the upper third of the shaft of the shin bone (*platynemia*). The platymeric index ranges in this series from 60 to 80, with an average a little over 70. This does not indicate a profound degree of flattening, and the condition is generally due to the development of a lateral flange associated with the line of attachment of the gluteus maximus muscle. The platynemic index is low, ranging from 60 to 75, with an average for the male bones of under 70 and slightly higher for the female bones. Figures below 70 indicate a marked degree of flattening.

The stature of these people was, as already indicated, short. The tallest man was 5 feet 7 inches and the shortest 5 feet 4½ inches, while the women hardly exceeded 5 feet. The tallest woman was about 5 feet 1·3 inches, the shortest 4 feet 11 inches. There is, of course, a considerable margin of possible error in the calculation of stature from the long bones, but in any event the individuals in these two groups were definitely below the average stature of the present inhabitants of Scotland as a whole, which is about 5 feet 7 inches. The average stature of the Caithness men among Dr Tocher's (2) recruits was 5 feet 8 inches, while the Sutherland men were on the average 5 feet 10 inches in height; in no part of Scotland did the average fall below 5 feet 6 inches.

## 2. SKULLS.

The number of adult skulls from the two localities is seventeen—nine male and eight female. One of the skulls is too imperfect for detailed

measurement and has not been included in the table. Of the nine complete male skulls, Nos. B, M, 2 and 4, represent men in early middle life, the closure of the sutures having just begun. Nos. E and I are crania of men of full middle age, while J and O, having the chief sutures largely synostosed, represent persons advanced in years. Specimen D, although it is the skull of a fairly elderly man, has all the teeth in place, but they are greatly worn. In specimen J all the teeth have been lost during life save two in the lower jaw.

Of the eight women, one represented by Skull F died in the early twenties; four represented by Specimens L, N, 1 and 6, had reached the fourth decade of life; one represented by Skull 3 was of full middle age, and one represented by Skull K was an old person.

The very good state of preservation of the teeth is a striking feature in this series of crania. There is no trace of caries, nor of the effects of periostitis, but in some there is a considerable accumulation of tartar. The crowns of all the teeth even in the younger persons are much worn. The cusps have been ground down, the enamel quite worn away, and the dentine fully exposed and polished by the friction of gritty particles in the food.

The occlusion is normal in all the specimens, but in one (B) there has been some crowding of the front teeth, the lower lateral incisors being placed obliquely between the canines and the lateral incisors. In cases in which the wear of the crowns is considerable the incisors have broad, flat surfaces, showing that even the front teeth had been employed in grinding the food.

An examination of the table shows that there is considerable variation in the dimensions of the individual crania. The general characters, however, are much the same in all. The majority of the skulls are light, thin-walled, and feebly marked. The glabella is flat, the superciliary ridges are poorly developed, and the outlines are smooth. The face is, generally speaking, narrow, but only moderate in height; the nose is narrow at the bridge. A noticeable feature in the male skulls is that the nasal bones show a depression a few millimetres below the nasion. From this point they are straight, and project forward at a rather acute angle. I mention this as the projecting narrow nose is regarded as a Nordic cranial feature. Quite different, however, is the skull labelled G. It is a heavy, thick-walled cranium. The glabella is very prominent, the brow ridges are strongly developed, and there is a well-marked supraglabella fossa. The muscular markings are specially well marked, and the superior nuchal lines are raised, especially at their medial ends, into ridges. The inion is prominent, and there is a distinct supra-inial recess.

The skulls in the present series have a general resemblance to those from graves at Keiss long ago described by Huxley. The varieties of crania which he speaks of as types may be all more or less clearly recognised. Only two male skeletons were included in Huxley's series; one of these was about 5 feet 7 to 8 inches in stature, the other 5 feet 4 to 5 inches. The women were all short, just under or just over 5 feet.

It seems clear that we have to do with the same stock of people.

An analysis of the measurements shows that the form of these skulls is that technically known as Dolichocephalic. In one skull only, and that among the female specimens, does the cranial index approach the limits of brachycephaly. Although several skulls, both male and female, are, strictly speaking, to be included in the conventional mesocephalic category, the indices are all very slightly above the lower limit of this class, and they belong essentially to the elongated narrow type. The average indices of the Scottish crania measured by Sir William Turner was 77·4 in the men and 77·2 in the women. The corresponding mean indices in the present group of skulls are 74 and 75·6 respectively. In Dr Matthew Young's large series of West Scottish skulls the mean index for the male crania was 74·36 and for the female 76·03. Our series agrees more closely in respect of mean cranial index with the West Scottish skulls than with Turner's collection. When a comparison is made between the cranial index, *i.e.* the proportions of the measurements on the skull, with the cephalic index in living individuals, we must add roughly two units to the skull index to get the head index. The indices for this series would then become 76 and 76·5 respectively for the men and the women during life. The corresponding indices for the whole of Scotland in Dr Tocher's measurements of the inmates of asylums (5) are 77·56 and 77·96, while in his tables for 2687 recruits measured during the Great War the average index was 77·9. The present sample is thus on the average more dolichocephalic than the present-day inhabitants of Scotland taken as a whole, but if we compare the figures for the North of Scotland we find that the difference is still greater. The mean index among the recruits from the Northern Counties, including Orkney and Shetland, was 78·96, while in the male inmates of the asylums hailing from the North the index also rose above 78.

Our small samples from Ackergill and Rennibister are thus decidedly more long-headed than the present-day population. It is to be noted that there is a greater difference between the sexes in this group than in the larger collections of Scottish skulls. This is partly to be accounted for by the inclusion among the female skulls of one specimen with a markedly higher index than the rest. If we compare the absolute

TABLE II.

Catalogue letter or number	MALE.									Mean.	S.E.	FEMALE.									Mean.	S.E.
	Ackergill.					Rennibister.						Ackergill.					Rennibister.					
	B.	D.	G.	J.	M.	2.	4.	5.	E.			F.	K.	L.	N.	1.	3.	6.				
Capacity . . . . .	..	1720	1600	1360	1390	1490	1710	1560	1547.1	±54.0	..	..	1420	1300	1375	1510	1280	1430	1385.8	±35.2		
Glabello-occipital length	178	195	195	188	183	186	193	191	188.6	± 2.1	178	180	189	181	173	182	175	179	179.6	± 1.7		
Frontal breadth. 1 . . . . .	98	..	116	107	108	100	108	112	107.0	± 2.4	108	97	100	96	96	97	98	106	99.8	± 1.7		
"    "    2 . . . . .	93	..	100	90	102	95	99	98	96.7	± 1.6	96	93	96	86	93	96	92	100	94.0	± 1.5		
"    "    3 . . . . .	107	118	118	117	123	115	127	115	117.5	± 2.1	120	116	113	107	119	114	110	122	115.1	± 1.8		
Parietal breadth . . . . .	136	141	139	138	141	140	141	139.5	139.4	± 0.6	135	136	137	140	138	140	131	132	136.1	± 1.2		
Basibregmatic height . . . . .	132	134	144	134	130	137	148	138	137.1	± 2.2	127	132	135	122	127	141	127	132	130.4	± 2.1		
Auricular height . . . . .	107	116	122	116	106	111	120	119	114.6	± 2.1	110	112 ap.	116	100	107	98	108	115	108.3	± 2.3		
Basinasal length . . . . .	103	106	102	102	103	102	111	102	103.9	± 1.1	95	..	97	99	93	101	104	105	99.1	± 1.7		
Basialveolar length . . . . .	103	100	95 ap.	91	97	96	108	99	98.6	± 1.8	..	..	95	94	87	96.5	99	102	95.6	± 2.1		
Nasialveolar height . . . . .	76	76	76	67	69	72	76	69	72.6	± 1.4	..	..	70	66	67	65	65	70	67.2	± 0.9		
Nasimental height . . . . .	124	126	126	..	..	116	127	112	121.8	± 2.6	..	..	119	118	112	109	106	..	112.8	± 2.5		
Maxillary breadth. . . . .	94	96 ap.	96	94	90 ap.	91	95	107	95.4	± 1.8	..	..	88	89	79	90	98.5	89	88.9	± 2.5		
Bizygomatic breadth . . . . .	132	128	130	128	130	124	131	138	130.1	± 1.4	..	..	124	116	120	120	123	129	122.0	± 1.8		
Nasal height . . . . .	57	54	56 ap.	58	57	49	54	49	54.3	± 1.3	..	..	50	49	49	50	47	50.5	49.3	± 0.5		
"    breadth . . . . .	22	27	29 ap.	28	22	24	25	26	25.4	± 0.9	..	..	..	22	25	23	23	24	23.4	± 0.5		
Bidac. Base . . . . .	..	21	..	27	26	22	24	23	23.8	± 0.9	..	..	..	21	..	18.5	20	25	21.1	± 1.6		
"    Arc . . . . .	..	33	..	40	38	37	35	32	35.8	± 1.2	..	..	..	38	..	27	30	34	32.3	± 2.4		
Orbital height. R. . . . .	..	36	..	34	..	34	32	31	33.4	± 0.9	..	..	..	34	33	31	30	33	32.2	± 0.7		
"    "    L. . . . .	38	..	..	34	38	34	33	32	34.8	± 1.0	..	..	..	34	33	31	31	33	32.4	± 0.6		
"    breadth. R. . . . .	..	40	..	39	..	39	40	40	39.6	± 0.3	..	..	..	36	35	38	38	39	37.2	± 0.7		
"    "    L. . . . .	39 ap.	..	..	39	40	39	40	41	39.7	± 0.3	..	..	..	36	35	39	38	39	37.4	± 0.8		
Palatal length . . . . .	..	56	60 ap.	51	..	54	59	57	56.2	± 1.4	..	..	50 ap.	50	..	54	51	56	52.2	± 1.2		
"    breadth . . . . .	..	65	65	60	..	59	64	62	62.5	± 1.1	..	..	60 ap.	58	..	60	58	57	58.6	± 0.6		

Dental index . . .	40.7	40	39.2	..	..	39.2	37	43.1	39.9	± 0.8	41	..	39.1	39.3	..	39.6	..	..	39.8	± 0.4
Sagittal arc. 1 . . .	125	138	140	135	118	129	127	127	129.9	± 2.6	130	..	132	113	122	133	126	116	124.6	± 3.0
„ „ 2 . . .	109	130	120	130	114	127	138	130	124.8	± 3.4	128	125	123	125	128	126	110	121	123.3	± 2.1
„ „ 3 . . .	116	122	131	115	118	123	125	128	122.3	± 2.0	107	107	127	112	110	118	105	114	112.5	± 2.6
„ „ Total . . .	350	390	391	380	350	379	390	385	376.9	± 6.1	365	..	382	350	360	377	341	351	360.9	± 5.6
Length: foramen magnum . . .	38	41	36	36	38	37	38	36	37.5	± 0.6	..	..	36.5	37	32	38	38	36.5	36.3	± 0.9
Transverse arc . . .	297	318	316	320	303	308	325	308	311.9	± 3.3	..	..	..	280	304	316	..	310	302.5	± 7.9
Circumference. (Flowers)	505	534	530	520	523	515	535	530	524.0	± 3.7	500 ap.	..	518	498	504	511	485	511	503.9	± 4.1
INDICES.																				
Length-breadth . . .	76.4	72.8	71.26	73.4	77	75.2	73	73	74.0	± 0.7	75.4	75.5	72.25	76.2	79.7	76.9	74.8	73.7	75.6	± 0.8
Length-height . . .	74.1	68.7	73.8	71.27	71	73.1	76.5	72.2	72.6	± 0.8	70.9	73.9	70.1	67.4	73.4	77.4	72.5	73.7	72.4	± 1.1
Gnathic . . .	100	94.3	92.1	89.2	94.1	94.1	97.3	97	94.8	± 1.2	..	..	97.9	94.9	..	95.5	95.1	97.1	96.1	± 0.6
Upper facial . . .	56.8	59.4	58.4	52.3	..	58	58	50	56.1	± 1.3	..	..	..	..	..	57.5	52.8	54.2	54.8	± 1.4
Complete facial . . .	94.7	98.4	96.9	..	..	93.4	96.9	81.1	93.6	± 2.6	..	..	95.9	..	..	90.8	86.1	..	90.9	± 2.8
Nasal . . .	38.6	53.8	51	53.8	..	49	46.2	53	49.3	± 2.1	..	..	..	45	..	46	46.6	47.5	46.3	± 0.5
Orbital. R. . . .	..	87.8	..	87.1	..	87	80	77.5	83.9	± 2.1	..	..	..	97	..	81.6	79	84.6	85.6	± 4.0
„ L. . . .	..	..	..	87.1	87.1	87.1	82.4	78	84.3	± 1.8	..	..	..	97	..	79.5	81.5	84.6	85.7	± 3.9
Palatal . . . .	..	115	108	117	..	109.2	108.4	108.7	111.1	± 1.6	..	..	120	116	..	111.1	113.7	101.8	112.5	± 3.1
MANDIBLE.																				
Condyl-symph. Length	128	128.5	132	123	..	122	130	121	126.4	± 1.6	126	101	125	118	112	117	120	115	116.8	± 2.8
Height at symphysis . . .	32	32	35	26	..	30	34	32	31.6	± 1.1	32	30	30	26	27	27	26	30	28.5	± 0.8
Height at 2nd molar . . .	29	25	29	29	..	29	30	27	28.3	± 0.6	28	24	30	24	25	22	23	26	25.3	± 0.9
*Height (vertical): ramus	62	54	62	55 ap.	..	50	57	52	56.0	± 1.8	..	44 ap.	52	44	44	41	44	..	44.8	± 1.5
Breadth: ramus . . .	34	32	34	36	..	34	36	36	34.6	± 0.6	..	29	35	36	30	32	29	..	31.8	± 1.2
Bicondylar width . . .	119	..	125	118	..	..	115	123	120.0	± 1.8	..	108	..	115	108	114	121	..	113.2	± 2.4
Bigonial width . . .	..	106	101	..	..	..	93	102	100.5	± 2.7	..	93	..	98	98	95	93	96	95.5	± 0.9
	B.	D.	G.	J.	M.	2.	4.	5.			E.	F.	K.	L.	N.	1.	3.	6.		

\* Taken at right angles to Frankfort Plane.

lengths and breadths we find that the mean breadth falls more below the mean of the present population than does the mean length. This explains the relatively lower cranial index of the present series. If the length-breadth index is lower, it would appear that in both male and female skulls the height index is greater than it was in Turner's skulls. Our means are 72.6 and 72.4 respectively against 70.9 and 70.5 in the Scottish skulls as a whole. Our skulls fall into the *metriocephalic* or *orthocephalic* category—that is, they are of medium height compared with their length. It is to be noted, however, that whereas in the whole of Turner's collection of Scottish skulls in only two specimens did the vertical height exceed the breadth, in the present series the height was greater than the breadth in two of the male and one of the female skulls. In a second female cranium the two diameters were equal. There is a tendency, then, for our skulls to present a relative greater degree of vertical height than the general Scottish average. In regard to the capacity of the skull in this series there is to be noted a marked difference between the sexes. The female skulls are smaller in every sense than the male skulls. The average capacity for the men is distinctly higher than the general Scottish average, but is almost the same as that of the West Scottish series. This is a second feature, therefore, in which the sample of ancient Northern skulls agrees with the West Scottish series.

Coming next to the characters of the face, the gnathic index which expresses the degree of projection of the upper jaw is fairly uniform. In one specimen only (B) are the compared measurements equal—in all the others the basialveolar falls short of the basinasal length, and the skulls are in technical terms *orthognathic*. The mean indices are practically the same as those recorded for Turner's and Dr Matthew Young's collections of skulls.

In respect of the orbital dimensions the present group agrees more with the West Scottish series of skulls than with Turner's series from Scotland as a whole. The orbital index is low, indicating a relatively low and rectangular, rather than a round orbit.

The characters of the nose are not in any way different from those recorded for the other Scottish series mentioned. The majority of the male skulls are *mesorhine*—only two are *leptorhine*, i.e. possess noses in which the width is small in relation to the height. On the other hand, all the female skulls in which the dimensions could be ascertained fall into this category.

The shape of the bony framework of the face minus the lower jaw is expressed by the so-called upper facial index. In every case the face is relatively high and narrow, or in technical terms *leptoprosopic*. It is

to be observed that the complete facial index expressing the form of the whole face with jaw attached, also gives a leptoprosopic character to the face, except in two cases one male skull (5) is *chamæprosopic*, while one female skull (3) just fails to fall into the same category. There is nothing, however, to distinguish the skulls of the present series as a whole from those of Turner or Matthew Young in respect of facial characters.

To sum up, the Ackergill and Rennibister skulls are moderately long and relatively narrow; tend to be high in the vertical diameter; show no projection of the jaws; have moderately high, narrow noses and moderately high narrow faces, and fairly low rectangular orbits. They are in technical terms dolichocephalic, metriocephalic, orthognathous, mesorhine or leptorhine, according to the sex, leptoprosopic and mesoseme.

I have, using the method developed in Professor Karl Pearson's (6) laboratory, constructed type contours, sagittal, horizontal, and vertical (figs. 1, 2, and 3), for the eight male skulls. The figures represent the mean characters of those eight skulls, and as they are reproduced at full scale they can readily be compared with similar figures for other series. The working lines used for obtaining the type contours have been omitted in the reproduction of the figures, as only the outlines were desired for this paper. No Scottish series has been thus reconstructed so far, but a comparison may be instituted with the type contours for the series of seventeenth-century Londoners and the series of Anglo-Saxon skulls recently published in *Biometrika* (7). When the sagittal type contour of the seventeenth-century series is superimposed on that of this sample of Northern skulls, it is found that the horizontal line from nasion to occipital bone ( $\gamma$  point) exactly corresponds in length. This line is, further, only one millimetre higher above the Frankfurt plane in the Scottish skulls than it is in the London series. The vault above the line is, however, higher and fuller behind. The greater height of the vault is also obvious when the transverse vertical contours are superimposed. Other features of difference are the elevation of the vault in the median sagittal plane, and the flatness and straightness of the side walls.

The horizontal contours are much alike, but the Scottish skull has greater glabello-occipital length. This is also brought out in the sagittal contour, in which the occipital bone bulges backwards more than in the London skull. The width of both skulls is practically identical posteriorly, and the points indicating the temporal crests almost coincide, but the Scottish skull is narrow in the temporal region. When the temporal crest points are superimposed it is seen that the side walls back to the position of maximum width are straighter. The

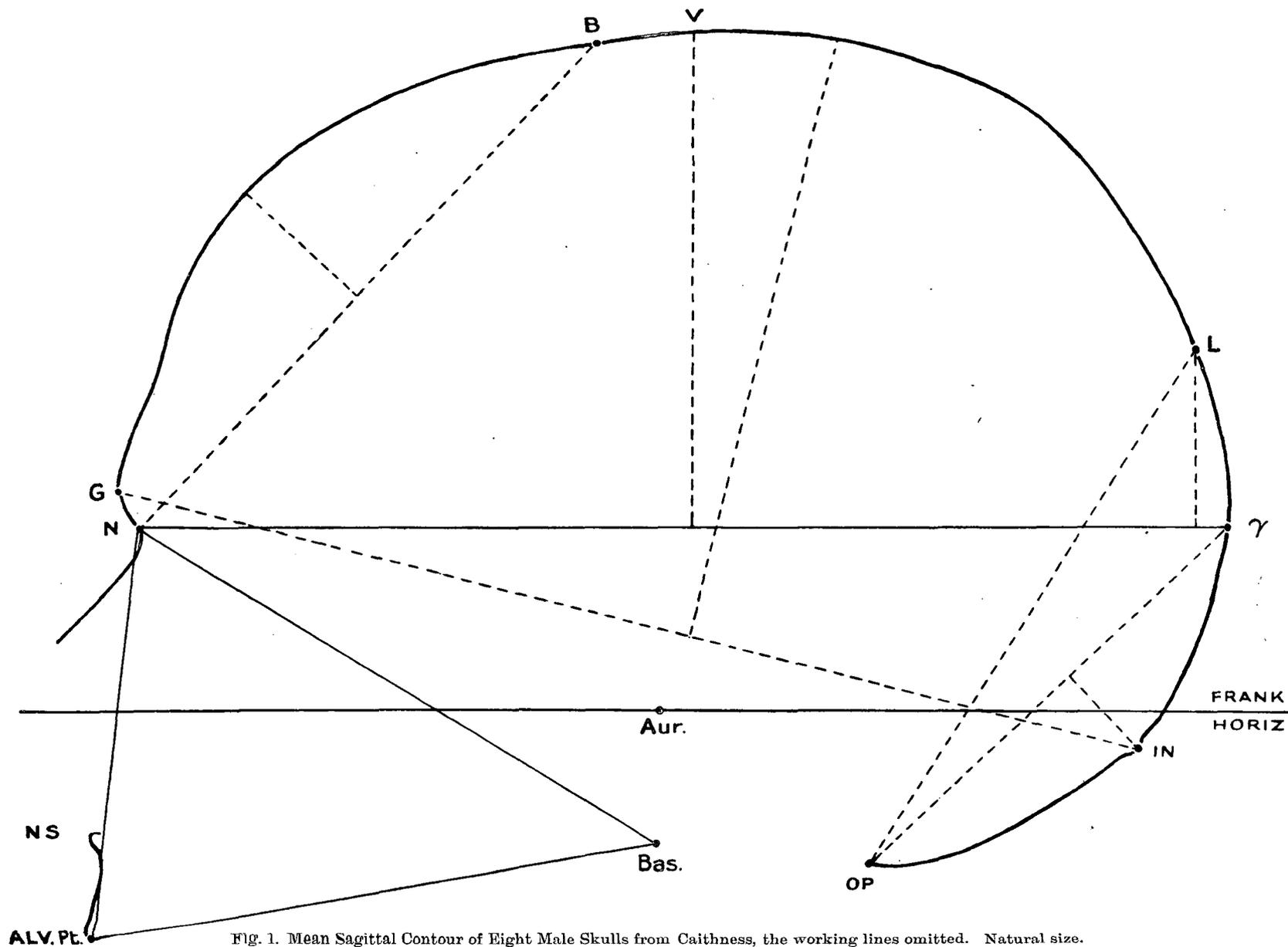


Fig. 1. Mean Sagittal Contour of Eight Male Skulls from Caithness, the working lines omitted. Natural size.

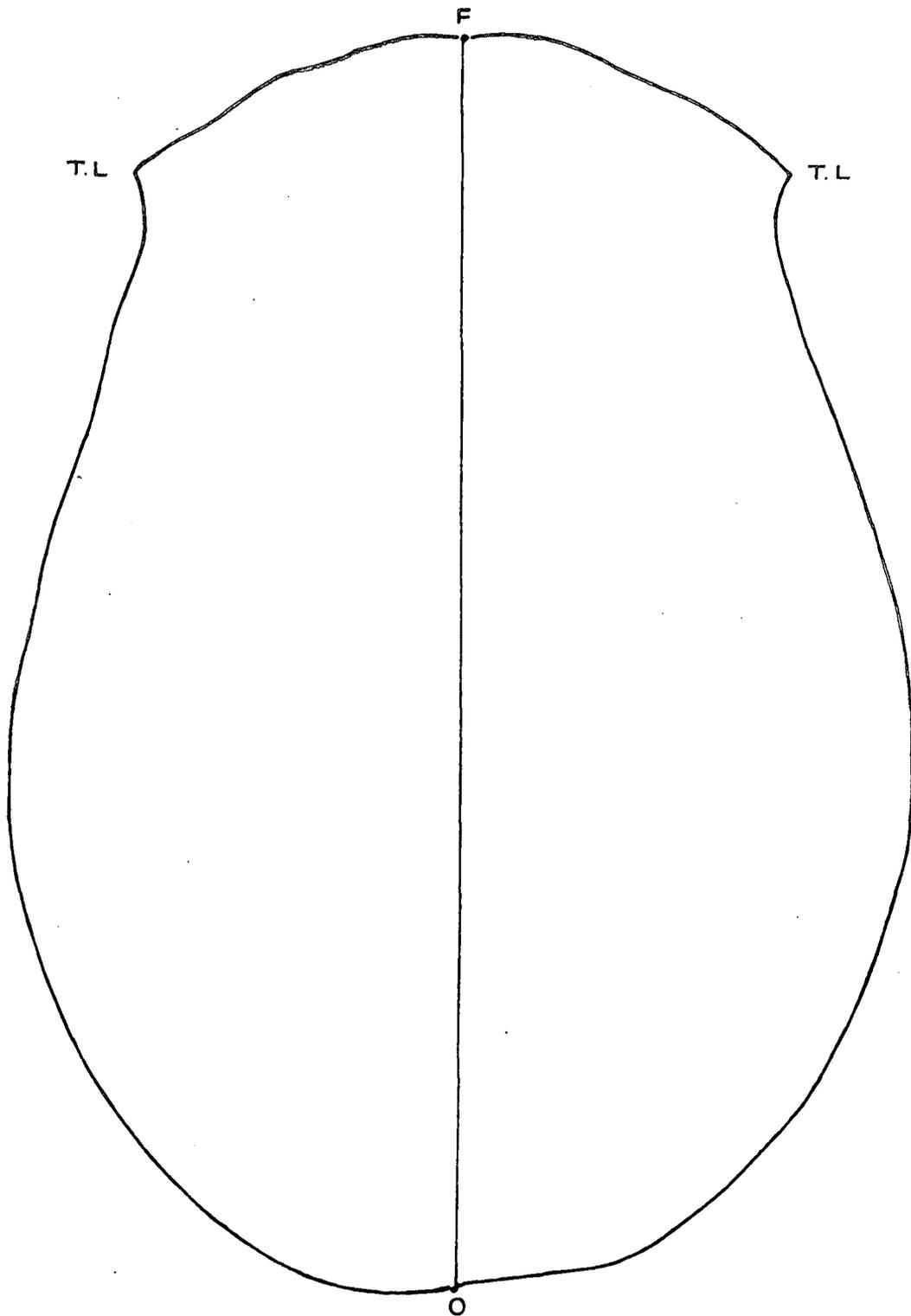


Fig. 2. Mean Horizontal Contour of Eight Male Skulls from Caithness, in the plane of greatest length (glabello-occipital). Natural size.

flatness of the sides in the forward part of the skull gives a somewhat different character to the outline in the norma verticalis.

The Anglo-Saxon type contours differ from those of the seventeenth-

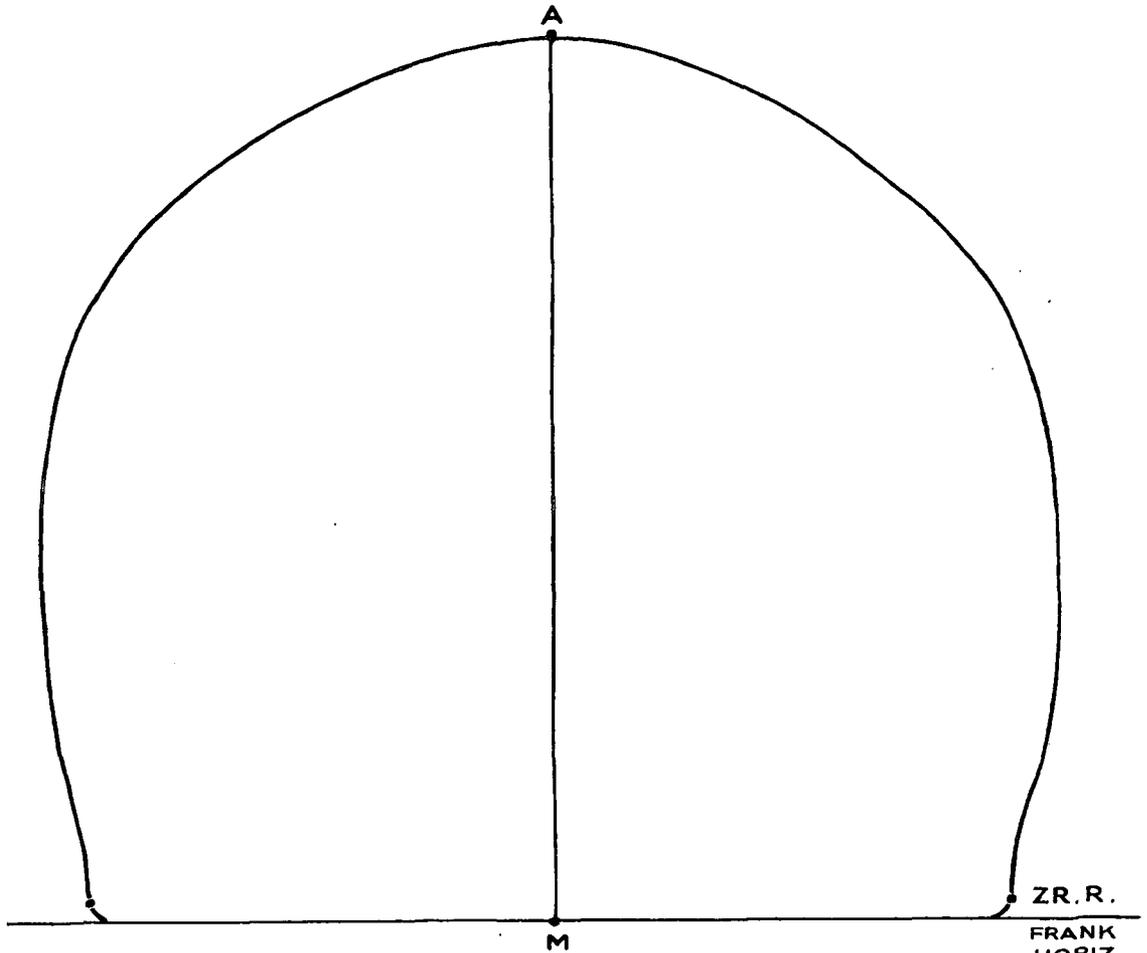


Fig. 3. Mean Vertical Contour of Eight Male Skulls from Caithness, in the plane of the auricular points. Natural size.

century series in just these same particulars, and the correspondence in form, and also in dimensions, between the Anglo-Saxon and the Northern skull is remarkably close. Our Northern mean skull is a trifle shorter and a very little narrower, but slightly higher than the Anglo-Saxon. Again, in almost every respect these Northern skulls correspond to the type defined

by Sir William Turner and considered as the prevailing one in Scotland, except in two particulars. The first of these is the greater height, and the second the greater degree of flatness of the side walls. The first feature they share in general with races in which the head has pronounced dolichocephalic proportions. The second feature distinguishes what has been termed an "ill-filled" skull, and characterises what may be regarded as a more primitive type.

In the North of Scotland, at the period to which the skeletons from Ackergill belong, the population must have been much mixed, containing Mediterranean and Nordic as well as some Alpine elements just as it does to-day. The rather low average Ackergill stature is against a pure Nordic origin, but the skulls show certain Nordic characters and resemble, taken as a whole, skulls known to be Anglo-Saxon. It would seem reasonable to conclude that these early folk formed part of the settled native population rather than that they represented recent invaders from over the Eastern sea. The long bones from the Viking grave recovered by Mr Edwards form, in length and robustness, a strong contrast to the bones from Ackergill and Rennibister, but the skull affords little help in the way of comparison. Instead of being an elongated skull with a low index it is of rounded form with an index of 82. A skull of this shape is of course not of the Nordic, but of the Alpine type, which was represented on both sides of the North Sea before Viking days.

I have to express my indebtedness to Dr Matthew Young for kindly calculating for me the means of the measurements and their standard errors.

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