

**A contribution to the craniology of the people of Scotland. Pt. I. Anatomical  
/ by Sir William Turner.**

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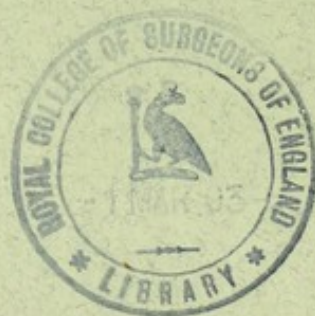
A CONTRIBUTION TO THE CRANIOLOGY OF THE  
PEOPLE OF SCOTLAND.

PART I.—ANATOMICAL.

BY

PROFESSOR SIR WILLIAM TURNER, K.C.B., D.C.L., F.R.S.

[WITH FIVE PLATES.]



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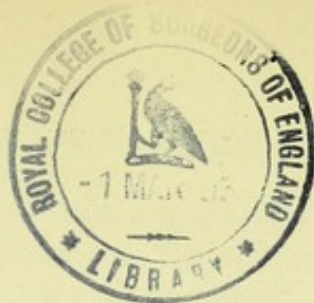




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XXIV.—*A Contribution to the Craniology of the People of Scotland.*  
Part I., *Anatomical.* By Professor Sir WILLIAM TURNER, K.C.B., D.C.L., F.R.S.  
(With Five Plates.)

(Read November 3, 1902. Issued separately February 10, 1903.)

Up to the present time no systematic account of the cranial characters of the people of Scotland has been published. Incidental references to, and measurements of, a limited number of Scottish skulls may indeed be found in the writings of various authors, as in Sir DANIEL WILSON'S *Prehistoric Annals of Scotland*, in Drs DAVIS and THURNAM'S *Crania Britannica*, and in Professor CLELAND'S *Memoir on Variations in the Human Skull*.<sup>\*</sup> Measurements of five Scottish crania are recorded by Sir W. H. FLOWER in the Osteological Catalogue (Man) of the Museum of the Royal College of Surgeons of England, four of which were found amongst the ruins of an ancient Culdee Monastery at St Andrews, and the fifth is said to be that of a Highlander. Dr BARNARD DAVIS, in his *Thesaurus Craniorum*, gives the measurements of a somewhat larger number, six of which were from Caithness, and one is stated to be a Scottish Highlander. The same skulls have been remeasured and described by Dr J. G. GARSON.<sup>†</sup>

A number of years ago I began to form a collection with the view of studying the characters of the skull in the Scottish people; but the acquisition of authentic examples from definite localities is a slow process, and time is required to obtain sufficient specimens to enable one to form a general conception of their form and proportions. Every teacher of Anatomy has, of course, the material provided by his practical rooms, but the greater number of these crania are of necessity cut in pieces in the course of the dissection; as a rule also, so little is known of the history of the waifs and strays of humanity who come within the provisions of the Anatomy Act, that in many instances it is difficult to ascertain their nationality or race, though presumably in Edinburgh the majority would naturally be Scotch. As belonging also to the pauper part of the community, one cannot obtain from the study of their skulls a due conception of the cranial type of the educated and well-to-do classes. It is therefore to a limited extent only that I have employed in this investigation specimens from the dissecting room, and not unless I could ascertain either the name of the person, or from other satisfactory reason feel tolerably certain that the skull was that of a Scot.

I have consequently looked elsewhere for additions to my material, and have been fortunate to obtain, through the kind interest taken in the subject by several former pupils, and from other friendly sources, skulls from known localities, from Shetland in the North to Wigtonshire in the South, and from Iona in the West to Dunbar in the East.

<sup>\*</sup> *Philosophical Transactions*, 1869.

<sup>†</sup> Osteology of the ancient inhabitants of the Orkney Islands. *Journal Anthropological Institute*, vol. xiii., 1883.  
TRANS. ROY. SOC. EDIN., VOL. XL. PART III. (NO. 24).



As might be expected, Edinburgh and the counties of Fife, East Lothian, and Mid-Lothian have furnished me with a considerable proportion of the specimens.

The collection long located in Edinburgh in the Phrenological Museum through an arrangement made with the Henderson Trustees having been deposited in the Anatomical Museum of the University, has also been made available for my purpose, though I have not included in my tables some specimens in it which, though probably Scottish, wanted a precise statement of locality. Several of the crania belonging to this collection are of great interest, and whenever the locality was definitely stated, to ensure that the skull was Scottish, it has been examined and noted. Altogether one hundred and seventy-six skulls have been studied. Comparatively few had the lower jaw attached to the cranium. Unfortunately, many were more or less injured, especially in the facial region, so that the proportions of that part of the skull have been estimated from a smaller number of examples than were available for the study of the cranial box. As the majority of the skulls described have been obtained in the counties south of the Clyde and the Tay, this memoir is more especially descriptive of the cranial characters of the people of lowland Scotland.

*Fifeshire.* TABLE I. PLATES I., II., V.

The skulls from Fifeshire were from two localities.

*a.* The greater number were obtained during the operations connected with the rearrangement, some years ago, of the interior of a parish church in the landward part of the county. In removing the pavement and the subjacent earth, quantities of human bones were exposed. Fifteen skulls came into my possession, and although some were injured, the majority were in good order. To only one specimen was the lower jaw attached. From the place of interment being within the church, it is to be presumed that the skulls belonged to parishioners of the better class. It is probable that the interments were made in the eighteenth century, when intramural burials were not uncommon, and it is doubtful if any had been later than the earlier part of the century following. From these specimens, therefore, one may form a good idea of the cranial characters of the educated people of this part of the county. Measurements of the crania, distinguished by the letter M, are given in Table I.

They were apparently twelve males and three females, and were, with two exceptions, the skulls of persons in middle or even more advanced life; the specimen measured in the first column of that table was known to be from a man *æt.* 66, and the ages of the other specimens are approximately stated. In four specimens the face was much injured. In the skulls where the upper jaw was uninjured, the teeth were in part worn down and decayed; though on the whole they were well preserved. In the majority of the skulls, the sutures of the vault were in process of obliteration; but two crania, a male and a female, were metopic.



*Norma verticalis*.—The skulls were characteristic examples of “well-filled” crania.\* As a rule, they were broadly ovoid, and the transverse diameter of the vault of the cranium was so marked that the outline was rounded, and the majority of the skulls were obviously either brachycephalic or approaching thereto. There was no sagittal keel or ridge, the parietal bone sloped gently downwards and outwards from the sagittal suture to the parietal eminence, and the transverse arc of the cranium behind the bregma was a low rounded arch. The side walls were not vertical, and in the majority of the specimens the greatest transverse diameter was near the squamous suture. In only five of the crania were the zygomatic arches unbroken, and in all but one the arches were concealed or cryptozygous. In all the specimens the parieto-squamous breadth was greater than the interzygomatic. The stephanic diameter exceeded the asterionic with two exceptions, and in one of these the diameters were equal.

*Norma lateralis*.—In the males the glabella and supraorbital ridges were distinct, and the forehead had a slight backward slope. From a little in front of the obelion the skull sloped downwards and backwards into the occipital squama, which projected in a marked manner behind the inion, so that the fossa for the occipital lobes of the cerebrum considerably overlapped the cerebellum. With three exceptions the crania rested behind on the conceptacula cerebelli, which indicated a considerable convexity of the inferior surface of the hemispheres of the cerebellum. In the exceptional crania the skulls rested behind on the tips of the mastoid processes. In the profile outline of the face the nasal bones projected forwards, and formed a well-marked bridge to the nose, which, in some specimens, was very prominent. The nasal spine of the superior maxillæ was also as a rule strongly projecting. In ten males the maximum total longitudinal arc was 384 mm., the minimum 361 mm., and the mean 373.9 mm.; in three females the maximum was 370, the minimum 346, and the mean 356.3. There was no constant rule, either for the entire series of these crania, or for the different sexes, as to the relative proportion of the frontal, parietal and occipital longitudinal arcs, though it was more usual for the frontal arc to be longer than either the parietal or occipital, and for the parietal to be longer than the occipital. But in four specimens the parietal exceeded the frontal; in four, the occipital was either equal to or exceeded the parietal, and in three the occipital was either equal to or exceeded the frontal.

The maximum glabello-occipital length in the twelve male skulls was 193 mm., the minimum 179 mm., and the mean 185 mm. In three females the maximum length was 181, the minimum 172, and the mean 176.3 mm. Of ten male skulls the maximum basi-bregmatic height was 137 mm., the minimum 125 mm., and the mean 130.3 mm.; whilst two females were respectively 120 and 121 mm. The maximum parieto-squamous diameter in the eleven males was 158 mm., the minimum was 136 mm., the mean being 149.6 mm.; whilst in three females the maximum was 141, the

\* This term is adopted from Professor Cleland's “Memoir on Variations in the Human Skull” (*op. cit.*).



TABLE I.—*Fifeshire.*

Collection,	Metopic	Mb.	Mc.	Md.	Me.	Mf.	Mg.	Mh.	Mi.	Mm.	Mn.	Mo.	Ml.	Mk.	Mp.	H.T.	H.T.
Age,	Ma.	abt. 60	abt. 60	abt. 50	abt. 70	abt. 60	60-70	60-70	30-40	60-70	60-70	60-70	abt. 30	abt. 50	abt. 60	D. 578	D. 582
Sex,	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	F.	F.	F.	M.	F.
Cubic capacity,	1636	1380	1598	1490	1442	1515	...	...	...	1495	...	...	1275	...	1182	1700	1200
Glabello-occipital length,	189	179	193	186	186	180	182	181	190	183	179	192	181	176	172	201	176
Basi-bregmatic height,	129	133	134	127	125	128	132	130	128	137	...	...	120	...	121	141	135
Vertical Index,	68.3	74.3	69.4	68.3	67.2	71.1	72.5	71.8	67.4	74.9	...	...	66.3	...	70.3	70.1	76.7
Minimum frontal diameter,	112	98	98	94	98	96	100	...	94	96	93	94	93	96	88	101	91
Stephanic "	128	117	126	120	126	130	123	123	116	125	95	117	111	111	108	...	95
Asterionic diameter,	124	112	126	111	113	109	113	117	109	116	106	110	110	94	102	115	99
Greatest parieto-squamous breadth,	157s.	149s.	151s.	146s.	158s.	152s.	145s.	151s.	...	156s.	136	145	141s.	131s.	137p.	144s.	128s.
Cephalic Index,	83.1	83.2	78.2	78.5	84.9	84.4	79.7	83.4	...	85.2	76.	75.5	77.9	74.4	79.7	71.6	72.7
Horizontal circumference,	560	528	548	537	550	528	524	...	545ap	530	505	540	515	500	497	555	485
Frontal longitudinal arc,	125	124	138	128	129	130	119	132	132	132	130	127	133	122	118	140	119
Parietal "	130	122	128	116	128	123	...	242	233	123	138	110	129	109	127	115	128
Occipital "	125	116	118	129	125	121	...	...	...	123	112	...	...	128	97	120	106
Total "	380	362	384	371	382	374	361	365	378	382	...	...	370	346	353	400	353
Vertical transverse arc,	322	303	324	308	327	324	306	320	310	325	310	333	297	288	300	320	280
Basal transverse diameter,	138	134	124	129	130	131	131	124	126	127	107	121	120	112	108	128	111
Vertical transverse circumference,	460	437	448	437	457	455	437	444	436	452	417	454	417	400	408	448	391
Length of foramen magnum,	32	34	36	35	31	30	34	36	33	35	...	...	29	...	31	37	33
Basi-nasal length,	108	98	106	101	96	99	104	98	101	96	...	...	91	...	...	109	96
Basi-alveolar length,	100	91	104	96	87	91	105	99	95	...	...	...	88	...	...	108	...
Gnathic Index,	92.6	92.9	98.1	95.	90.7	91.9	101.	101.	94.1	...	...	...	96.7	...	...	99.1	...
Total longitudinal circumference,	520	494	526	507	509	503	499	499	512	513	...	...	490	...	...	516	482
Interzygomatic breadth,	...	129	134	...	...	135	...	136	...	...	...	...	123	...	...	139	...
Intermalar,	134	122	116	112	114	117	...	122	115	...	...	...	109	106	...	123	...
Nasio-mental length,	...	...	...	...	...	...	...	...	114	...	...	...	...	...	...	135	...
Complete Facial Index,	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	97.	...
Nasio-alveolar length,	79	76	77	75	75	71	64	76	73	...	...	...	63	64	...	82	...
Maxillo-facial Index,	...	54.6	57.4	...	...	52.6	...	55.8	...	...	...	...	...	...	...	59.	...
Nasal height,	56	54	56	53	53	52	48	51	52	...	...	...	48	48	...	60	...
Nasal width,	26	25	23	24	21	25	23	25	21	...	...	...	23	24	...	24	...
Nasal Index,	46.4	46.3	41.1	45.3	39.6	48.2	47.9	49.	40.4	...	...	...	47.9	50.	...	40.	...
Orbital width,	43	40	38	39	40	39	40	40	39	...	...	...	38	38	...	37	...
Orbital height,	36	32	33	34	34	34	34	35	34	...	...	...	30	34	...	35	...
Orbital Index,	83.7	80.	86.8	87.2	85.	87.2	85.	87.5	87.2	...	...	...	78.9	89.5	...	94.6	...
Palato-alveolar length,	58	56	58	55	51	48	56	56	50	...	...	...	51	49	...	58	...
Palato-alveolar breadth,	63	71	63	59	57	53	...	69	59	...	...	...	57	55	...	65	...
Palato-alveolar Index,	108.	126.	108.	107.	111.	110.	...	123.	118.	...	...	...	111.	112.	...	112.	...
Lower jaw	Symphysial height,	...	...	...	...	...	...	...	...	...	...	...	...	...	...	35	...
	Coronoid "	...	...	...	...	...	...	...	63	...	...	...	...	...	...	72	...
	Condylod "	...	...	...	...	...	...	...	64	...	...	...	...	...	...	72	...
	Gonio-symphysial length,	...	...	...	...	...	...	...	86	...	...	...	...	...	...	102	...
	Inter-gonial width,	...	...	...	...	...	...	...	90	...	...	...	...	...	...	110	...
	Breadth of ascending ramus,	...	...	...	...	...	...	...	29	...	...	...	...	...	...	40	...



minimum 131, and the mean 136.3 mm. Of eleven male skulls the maximum horizontal circumference was 560 mm., the minimum 505 mm., and the mean 535.9 mm.; of three females the maximum was 515, the minimum 497, and the mean 504 mm. The maximum intracranial capacity in seven males was 1636 c.c., the minimum 1380 c.c., and the mean 1508 c.c.: two females were respectively 1182 and 1275 c.c.

Some of the crania exhibited individual peculiarities which require to be noted. In several males theinion and superior curved occipital lines were very distinct, but the temporal ridges were only moderate. Two female crania possessed an epipteric bone or bones in each pterion, and in a third an epipteric was present only in the right pterion. The ali-sphenoido-parietal articulation was usually wide, though occasionally it was attenuated. In one skull the right squamous-temporal articulated with the frontal. In six specimens a small Wormian bone, or bones, was present in the lambdoidal suture. In one skull the right external pterygoid plate was sutured with a bony plate from the spine of the sphenoid, and enclosed a large pterygo-spinous foramen, and in another specimen these two processes were almost united with each other on the right side. Two crania possessed rudimentary paramastoid processes, but no specimen had a third occipital condyle. Indications of an infraorbital suture in process of obliteration were seen in some of the skulls.

I shall now pass to the consideration of the indices obtained by a comparison with each other of two diameters. In eleven male crania the length-breadth or cephalic index presented a range of variation from a maximum of 85.2 to a minimum of 75.5, the mean being 81.1. No skull was below 75, but one was 75.5 and another 76; three ranged from 78.2 to 79.7; six were very distinctly brachycephalic, ranging from 83.1 to 85.2. The three female crania ranged from 74.4 to 79.7, with a mean of 77.3; two were mesaticephalic, and one was near the higher limit of the dolichocephalic group.

The length-height or vertical index ranged in ten males from 67.4 to 74.9 and the mean was 70.5. In two females the mean index was 68.3. In the females the height was not only absolutely less than in the males, but it was also less in relation to the length of the skull, so that the mean vertical index was less than the mean cephalic index. In every specimen, indeed, in which both the height and breadth could be measured, the breadth of the cranium materially exceeded the height. The crania were in the mean, tapeinocephalic (*chamæcephalic*), and only two specimens were metriocephalic.\*

The projection of the upper jaw, as estimated by the gnathic index, ranged in nine males from 90.7 to 101; only three specimens were mesognathous and the rest were orthognathous.

In one female this index was 96.7, the mean was orthognathous, and only three specimens were mesognathous.

\* I continue to use this term in preference to *orthocephalic*, as recommended by the German craniologists in the Frankfurt agreement, for the reasons given in my *Challenger Report*, 1884, note, p. 5.



The nasal index ranged in nine males from 39.6 to 49, and the mean was 44.9. With two exceptions the whole series was leptorhine, or with a long and narrow nose. The mean of two females was 48.9. The floor of the nose was separated from the incisive region by a well-defined and often a sharp ridge of bone.

The orbits were large, and a mean index of 85.5 was obtained in nine males, the variations being from 80 to 87.5. Two specimens only were microseme and seven were mesoseme. The two females were respectively 89.5 and 78.9.

The relative length and breadth of the palato-alveolar arch varied materially in those specimens which were sufficiently perfect to allow of the arch to be measured. Of eight male skulls three were dolichuranic, one was brachyuranic, two were hyperbrachyuranic, and two were mesuranic: collectively they gave a mesuranic mean 113.9, although a minority only of the specimens were in this group. Two female crania in which the arch was complete were mesuranic.

Either the absence of the lower jaw or the injured zygomatic arches prevented the proportions of length and breadth of the entire face from being taken, but in four specimens the length of the upper jaw was compared with the interzygomatic breadth and a mean maxillo-facial index 55.1 was computed; the face was therefore leptoprosopic.

b. In the collection belonging to the Henderson Trust are two normal skulls from the Abbey Church of Dunfermline, in the west of Fife, measurements of which are given in Table I., and they are distinguished by the letter D.

One of these skulls was a male aged apparently about 50. It was well proportioned, distinctly dolichocephalic, 71.6, and of unusually large cranial capacity, 1700 c.c. In its general configuration it bore some resemblance to the cast of the skull ascribed to King Robert the Bruce, and indeed was identical with that cast in the glabello-occipital diameter; but its transverse diameter was not so great by several millimetres, and it differed also in some other characters and dimensions. It gave one the impression of having belonged to a man of power and capacity. It is marked H.T. 578 D. in Table I., and is figured in Pl. I., fig. 1, 2, 3. From the measurements it will be seen that the height of the cranium, 141 mm., though one of the most lofty of the series, was 3 mm. less than the parieto-squamous diameter. As the glabello-occipital length was 201 mm., it is one of the longest crania examined in the series, and the horizontal circumference was considerably above the average. In the *norma verticalis* the cranium was ovoid, and the lateral walls were wider in the region of the squamous sutures than opposite the parietal eminences. The vertex had not so flat a transverse arc as in the series M, and the upper parietal region sloped a little more abruptly outwards to the parietal eminences, which were not prominent; there was no sagittal ridge. The occipital squama projected distinctly behind the inion and superior curved line. The glabella and supraorbital ridges were distinct, and the frontal bone sloped backwards and upwards. The skull was cryptozygous and rested behind on the cerebellar fossæ of the occipital bone. The bridge of the nose was not specially prominent: the nose was strongly leptorhine. The orbit was only 2 mm. wider than



high. Though the breadth of the face was considerable, its vertical diameter was so pronounced, owing to a well-developed lower jaw and an unusual vertical diameter of the superior maxillæ, that the complete index 97 was hyperleptoprosopic. The majority of the teeth were in place, not decayed and comparatively little worn. The hard palate had considerable depth. The gnathic index was in the lower mesognathic group. There were no special modifications in ossification, except that the right posterior condyloid foramen was unusually large, and tunnelled forwards so as to open into the jugular foramen. The left posterior condyloid foramen was absent.

The other skull from Dunfermline, H.T. 582 D., was wanting in the facial bones. It was evidently an adult female. It was elongated ovoid in shape, with a length-breadth index of 72·7, and in it the basi-bregmatic height was so much greater than the parieto-squamous breadth, that the vertical index was distinctly more than the cephalic. The parietal longitudinal arc was considerably longer than either the frontal or occipital. The cranium was not flattened at the vertex, and sloped steeply downwards from the sagittal ridge to the parietal eminences, below which the side walls were vertical. The glabella was feeble, the forehead was almost vertical. The parieto-occipital slope was gradual: the occipital squama was rounded, and projected behind the inion. There were no Wormian or epipteris bones.

*East Lothian.* TABLE II.

The skulls from East Lothian were obtained from three localities.

*a.* The larger number were procured in the course of extensive alterations connected with remodelling the interior of the nave of an old abbey church in the landward part of the county. The pavement and about 18 inches to 2 feet of earth were removed, and the bones were found principally at the bases of the pillars which supported the roof of the nave, and beneath where the pulpit stood. Without doubt they belonged to the better classes in the parish. It is said that the last interment within the nave was in 1795.

Thirteen skulls were collected, several of which were injured either in the cranium or face, and in none did the lower jaw accompany the skull. They were apparently ten males and three females. In only four specimens were the facial bones sufficiently entire to enable me to take the face measurements. In several the foramen magnum was so injured that the height of the cranium could not be taken. Two specimens were metopic. In five the sutures of the cranial vault were very distinct; but in the other crania they were in process of obliteration, so much so in two cases that the persons were obviously advanced in years. The teeth, as a rule, were lost; in one specimen they were flattened from use; in another they were not much worn. In at least two skulls the crania were obliquely distorted, as if from post-mortem pressure. The measurements of the crania are given in Table II., and the skulls are distinguished by the initial letter H.







*Norma verticalis*.—The skulls were well filled, and were not keeled or ridged in the sagittal region. The majority were so broadly ovoid as to be rounded in outline, and obviously of brachycephalic proportions. The parietal eminences in a few cases projected, but, as a rule, they had no special prominence, and the vault of the skull sloped gently downwards and outwards from the sagittal suture to the parietal eminence. The side walls were not vertical. The four specimens in which zygomatic arches were present were cryptozygous, and the interzygomatic diameter exceeded the intermalar, stephanic and asterionic; except in one skull, the stephanic diameter exceeded the asterionic.

*Norma lateralis*.—The glabella and supraorbital ridges were, as a rule, moderately prominent in the male skulls, but in two specimens they were more strongly marked. The forehead had a gentle slope backwards; the vertex was, as a rule, flattened; the curve from the postero-parietal into the occipital regions was usually gradual, but in two instances it was much more abrupt; the occipital squama above the superior curved line did not as a rule project much behind the inion. Four specimens sufficiently perfect to be tested rested behind on the conceptacula cerebelli. The nasal bones when present were prominent, and the bridge slightly concave; but in a female skull they were small and flattened below the fronto-nasal suture. The maxillo-nasal spine was moderately prominent, and the floor of the nose was separated from the incisive region by a sharp ridge. The maximum longitudinal arc in the males was 380 mm., the minimum was 345, and the mean of nine specimens was 366 mm. The occipital arc was always shorter than either the frontal or parietal, but the frontal arc in some exceeded the parietal, whilst in others the reverse was seen. The basi-nasal diameter could be taken in only a few skulls; the maximum was 104 mm., the minimum 95 mm., and the mean of six specimens was 99.8.

The maximum transverse diameter was near the squamous suture; in the male skulls it was 159 mm., and the minimum was 137 mm., whilst the mean was 147; in two females the maximum was 144, the minimum 136. The maximum glabello-occipital length in the ten male skulls was 194 mm., the minimum 175, whilst the mean was 183 mm. The basi-bregmatic height was measured in six specimens; in five, presumably males, it ranged from 121 to 135 mm.; whilst another, possibly a female, was 123 mm. The horizontal circumference had a maximum of 550 mm. and a minimum of 500, whilst the mean of seven males was 525 mm. The maximum vertical transverse circumference in the males was 481 mm., the minimum was 426 mm., and the mean of five males was 442.6 mm. The maximum longitudinal circumference in three males was 503 mm., the minimum 494, and the mean was 498 mm.

Few individual peculiarities were found in these crania. In one specimen the right squamous-temporal articulated at the pterion directly with the frontal; there were no epipterics. In one specimen Wormian bones were present in the lambdoidal suture; another had a sutural bone in the sagittal suture, 13 mm. behind the bregma. In one skull a vertical transverse depression was behind the coronal suture. No skull



had a third occipital condyle or paroccipital process, but in two crania the under surface of the jugal process was tuberculated. In one specimen an infraorbital suture was visible.

The length-breadth or cephalic index ranged in thirteen skulls from 86.3 to 72.2; six crania were upwards of 80, two being hyperbrachycephalic; three were between 78.3 and 79.1, approaching brachycephalic; two were 76.4 and 76.1 respectively, two had the index below 75 and were dolichocephalic. The mean length-breadth index of the series of skulls was 79.7, *i.e.*, approximately brachycephalic.

The length-height or vertical index could be taken in only six crania. In five males it ranged from 72.4 to 65.8, the mean of the series being 71.7. In no skull was the basi-bregmatic diameter equal to the parieto-squamous in the same specimen; but in one male the breadth only exceeded the height by 2 mm.; the cephalic index was always greater than the vertical index.

The projection of the upper jaw, as estimated by the gnathic index, ranged in the four males that could be measured from 103.2 to 96, and the mean was 98.8; the mean was mesognathous; in a female skull it was 103.2, barely prognathous. In one specimen the nasal height was short and the nares wide, so as to give the platyrhine index 55.3, but three other specimens had a mean leptorhine index 44. The orbital index of two males placed them in the megaseme class with the orbits high in relation to the width, whilst in two others the index was microseme, the width being proportionally greater than the height.

The palato-alveolar index had in the four skulls measured a considerable range of variation; two specimens were dolichuranic, one mesuranic, and one brachyuranic; the mean of the series, 109.4, was dolichuranic.

The absence of the lower jaw prevented one from taking the complete facial index, but in each of the four specimens the maxillo-facial index was leptoprosopic, and the mean of the series was 53.9.

Owing to injury to the cranial box, the internal capacity could only be taken in one specimen, 1305 c.c.

*b. North Berwick.*—Two crania from North Berwick are in the collection of the Henderson Trust. They were found in the old churchyard nearly fifty years ago, and are referred to in the *Prehistoric Annals of Scotland*.<sup>\*</sup> In both the facial bones had been broken away. They were from persons well advanced in life, and the sutures of the cranial vault had almost disappeared in the outer table. One was much larger than the other, and was obviously a male. It was a good example of a well-filled skull. The forehead was capacious, and the frontal suture had not quite disappeared. The vertex was flattened, and the descent from the obelion to the occipital squama was abrupt, but without evidence of parieto-occipital flattening. The skull was essentially brachycephalic, though the index, 79.8, was fractionally below the lower limit which custom

<sup>\*</sup> 1st edition, p. 175, 1851.



assigns to that type of cranium. The basi-bregmatic diameter was much less than the greatest breadth. The cranial capacity was 1600 c.c.

The smaller of the two crania was apparently a female. It was narrow in the frontal region, and gradually widened backwards to the parietal eminences, where the cranium had the greatest transverse diameter. The flattening at the vertex was also well marked in this skull. In the relations of length and breadth it was distinctly brachycephalic, 80·6. An injury to the base prevented one from taking the basi-bregmatic diameter and internal capacity.

*c. Dunbar.*—The skull, an adult male, was obtained at a burial-place in Dunbar, and is numbered 41 in the catalogue of the Henderson Trust. It was broadly ovoid in form and sloped gently backwards and downwards in the parieto-occipital region. The cephalic index, 77·5, was mesaticephalic; the basi-bregmatic diameter was much below the parieto-squamous. The face was orthognathic, the nose was leptorhine, the orbit was wide in relation to the height, and the palate was hyperbrachyuranic. The skull was metopic, but the most striking peculiarity was a double parietal bone on the left side.\* The intraparietal suture was strongly denticulated, and completely divided the left bone into two unequal moieties. The upper part was 106 mm. in antero-posterior diameter and 78 mm. in vertical diameter; the lower part was 104 mm. in antero-posterior and 38 mm. in its least vertical diameter. At the anterior or coronal end of the dividing suture two small sutural bones were interposed between it and the coronal suture, and the skull was depressed somewhat in this region. The lambdoidal and coronal sutures were strongly denticulated, and a small epipterice bone was situated in each pterion. All these sutures were distinctly marked on the inner table, though much more feebly denticulated than in the outer table, and it was observed that small sutural bones were differentiated in the inner table both at the lambdoidal end of the intraparietal suture and within the lambdoidal suture, additional to those already referred to in the exterior of the skull. A short paracondyloid process projected downwards from the under surface of the left jugal process.

#### *Mid-Lothian.* TABLES III., IV., V., VI., VII. PLATES II., V.

Collections of skulls were obtained from different localities in the county of Mid-Lothian. They may conveniently be arranged in three groups:—

- a.* Those collected in churches and churchyards in rural districts.
- b.* Those obtained from a church and churchyard near the sea coast.
- c.* Those obtained from interments in Edinburgh or its immediate vicinity.

*a.* Of those gathered in rural districts seven were procured from a churchyard on the western border of the county. They are distinguished in Table III. by the letter R.

\* I have described a similar condition in the right parietal of an Admiralty Islander in *Challenger Reports*, 1884, part xxix. plate iv. p. 57, and in the right parietal of an Australian in *Journal of Anatomy and Physiology*, vol. xxv. pp. 462–473.



Two skulls from villages on the northern slope of the Pentlands are marked B and C in the same Table. Four skulls from Lasswade, marked L in this Table, have been for a number of years in the collection of the Henderson Trust.

The nine skulls marked R, B, and C are from late interments, and I have little doubt are fairly representative of the country people of the western part of the county. I propose to look at them as a group. They were apparently eight males and one aged female. The sex of some of the persons was known to my correspondent from whom I obtained the specimens. The lower jaw was present in four skulls. Three crania were metopic. In five specimens, including the old female, the sutures were in process of being obliterated. The woman's skull was edentulous, and the measurements of the lower jaw, when compared with those in which the teeth were mostly present, show the effect produced by absorption of the alveolar border. In two specimens the teeth were much worn from use, in others they were much decayed; but in two the cusps of the molars were distinct.

*Norma verticalis*.—Four skulls were broadly ovoid, but the others were longer in relation to the breadth. They were all well filled, the transverse arc at the vertex was low and rounded, and there was no sagittal keel or ridge. In one a sagittal vertical transverse constriction was behind the coronal suture. In two metopic specimens the parietal and frontal eminences were prominent. The skulls were cryptozygous. The interzygomatic diameter exceeded the intermalar, stephanic and asterionic; the stephanic diameter exceeded the asterionic, but in three cases by only 2, 3 and 4 mm. respectively. The side walls were not vertical, and the maximum transverse diameter, except in one metopic skull, was in the region of the squamous suture.

*Norma lateralis*.—The forehead in most of the skulls had only a slight slope backwards, and the glabella and supraorbital ridges were moderately prominent. One of the three metopic crania had the widest minimum frontal diameter in the group; another was the third, and another the fourth in width in the same region. Owing to the flattening at the summit of the skull the antero-posterior curve of the vertex was moderate; the parieto-occipital region did not slope steeply downwards, though in some skulls it was a little more abrupt than in others: in a few crania the occipital squama did not project much behind the inion. The skulls rested behind on the conceptacula cerebelli, and in no specimen did the mastoids touch the table. The nasal bones were well formed, and with the bridge prominent and slightly concave. The maxillo-nasal spine was well marked, and the nasal floor was separated by a sharp ridge from the incisive region of the jaw. The maximum longitudinal arc in the males was 397 mm., the minimum 371, and the mean was 382.1 mm. The occipital arc, except in two skulls, was shorter than either the frontal or parietal. In four males the frontal arc was shorter than the parietal; in four the reverse was seen. The maximum basi-nasal diameter was 105 mm., the minimum 96, and the mean of seven males was 101.

The maximum transverse diameter was 155 mm., the minimum 136 mm., and the mean was 143.9 mm. The maximum glabello-occipital length was 194 mm., the



TABLE III.—*Mid-Lothian Rural Districts.*

Collection, . . . . .	Rw.	Metopic. Ry.	Rt.	Rx.	Rz.	Metopic. Rv.	Rs.	C.	Metopic B.	L. Ht.	L. Ht.383	L. Ht.386	L. Ht.566
Age, . . . . .	Adult.	Adult.	Ad.	Ad.	Ad.	Ad.	Aged.	Ad.	Ad.	66	Aged.	Adult.	Aged.
Sex, . . . . .	M.	M.	M.	M.	M.	M.	F.	M.	M.	M.	M.	M.	F.
Cubic capacity, . . . . .	...	1452	1545	1440	1500	1420	1405	1590	1470	1400	1800	1660	1625
Glabello-occipital length, . . . . .	194	189	188	181	187	185	181	191	187	191	204	196	193
Basi-bregmatic height, . . . . .	141	127	137	134	135	130	131	142	129	133	145	138	140
Vertical Index, . . . . .	72.7	67.2	72.9	74.	72.2	70.3	72.4	75.4	69.	69.6	71.1	70.4	72.
Minimum frontal diameter, . . . . .	96	102	103	99	88	104	95	95	99	94	104	97	106
Stephanic frontal diameter, . . . . .	129	129	117	130	118	124	117	120	115	104	...	118	119
Asterionic diameter, . . . . .	126	108	108	110	110	108	113	118	112	107	111	114	113
Greatest parieto-squamous breadth, . . . . .	155s.	136s.	144s.	145s.	142s.	140p.	144s.	148s.	141s.	137p.	150s.	143s.	153s.
Cephalic Index, . . . . .	79.9	72.	76.6	80.1	75.9	75.7	79.6	77.5	75.4	71.7	73.5	73.	79.3
Horizontal circumference, . . . . .	553	535	528	522	530	532	523	548	527	532	572	546	550
Frontal longitudinal arc, . . . . .	140	148	129	123	130	130	126	146	127	130	141	134	139
Parietal " " . . . . .	124	132	134	131	133	136	127	134	120	130	140	128	135
Occipital " " . . . . .	133	111	119	117	125	109	116	115	121	120	132	124	126
Total " " . . . . .	397	381	382	371	388	375	369	395	368	380	413	383	400
Vertical transverse arc, . . . . .	332	305	318	312	313	304	311	320	295	298	320	305	329
Basal transverse diameter, . . . . .	131	119	116	122	119	123	117	128	...	121	136	127	130
Vertical transverse circumference, . . . . .	463	424	434	434	432	427	428	448	...	419	456	432	459
Length of foramen magnum, . . . . .	38	36	32	34	35	35	36	37	36	33	38	41	32
Basi-nasal length, . . . . .	102	96	105	99	100	100	95	104	102	104	108	103	105
Basi-alveolar length, . . . . .	100	98	95	91	94	98	...	91	105	...	...	97	91
Gnathic Index, . . . . .	98.	102.1	90.5	91.9	94.	98.	...	87.5	102.9	...	...	94.2	86.7
Total longitudinal circumference, . . . . .	537	513	519	504	523	510	500	536	506	517	559	527	537
Interzygomatic breadth, . . . . .	136	134	135	...	125	...	121	132	138	131	143	131	135
Intermalar " " . . . . .	115	121	121	...	112	112	107	115	121	117	127	112	118
Nasio-mental length, . . . . .	122	122	136	...	...	...	...	...	...	...	...	...	...
Complete Facial Index, . . . . .	89.7	91.	100.	...	...	...	...	...	...	...	...	...	...
Nasio-alveolar length, . . . . .	75	72	75	74	67	71	...	75	73	...	...	74	70
Maxillo-facial Index, . . . . .	55.	53.7	55.5	...	53.6	...	...	56.8	52.9	...	...	56.5	51.8
Nasal height, . . . . .	57	50	53	53	50	51	54	54	52	52	58	56	52
Nasal width, . . . . .	23	22	24	21	23	22	26	22	24	28	22	24	24
Nasal Index, . . . . .	40.3	44.	45.3	39.6	46.	43.1	48.1	40.7	46.	53.5	37.9	42.8	46.
Orbital width, . . . . .	41	39	40	37	38	41	38	40	38	39	40	40	41
Orbital height, . . . . .	36	31	36	34	31	33	31	33	34	33	38	37	37
Orbital Index, . . . . .	87.8	79.5	90.	91.9	81.6	80.5	81.6	82.5	89.5	84.6	95.	92.5	90.2
Palato-alveolar length, . . . . .	56	55	58	54	53	54	...	52	58	...	...	54	52
Palato-alveolar breadth, . . . . .	60	59	57	...	64	...	...	61	...	...	...	...	60
Palato-alveolar Index, . . . . .	107.	107.	98.2	...	120.	...	...	117.	...	...	...	...	115.3
Lower jaw.	Symphysial height, . . . . .	33	36	35	...	...	...	28	...	...	...	...	...
	Coronoid " " . . . . .	73	70	71	...	...	...	66	...	...	...	...	...
	Condylod " " . . . . .	77	68	73	...	...	...	62	...	...	...	...	...
	Gonio - symphysial length, . . . . .	83	94	92	...	...	...	82	...	...	...	...	...
	Inter-gonial width, . . . . .	103	99	100	...	...	...	83	...	...	...	...	...
Breadth of ascending ramus, . . . . .	34	45	34	...	...	...	31	...	...	...	...	...	...



minimum 181, and the mean of the seven male skulls was 187.8. The basi-bregmatic height ranged in the males from 144 to 127 mm., and the mean of the series was 134.4 mm. The horizontal circumference had a maximum 553 mm., a minimum 522, and the mean was 534.3 mm. The maximum vertical transverse circumference was 463 mm., the minimum 419, and the mean 436.9 mm. The maximum total longitudinal circumference was 536 mm., the minimum 504, and the mean 519.2. The intra-cranial capacity ranged in the males from 1590 to 1420 cub. cent., and the mean was 1431 cub. cent. The crania were, with two exceptions, in the megacephalic group. The only female skull, like two of the males, was mesocephalic in its capacity.

Few individual peculiarities were seen in these skulls. Two skulls had each a right epipteric bone and one a left: in one of the metopic skulls the right squamous-temporal just touched the frontal; in another skull the alisphenoid had a narrow articulation with the parietal. Small Wormian bones were present in three crania in the lambdoidal suture. There was no condylus tertius or paramastoid process, though in one the jugal process was strongly tuberculated. The remains of an infraorbital suture were seen in these crania. In two the external pterygoid plate was prolonged for some distance backwards into a pointed process, due to partial ossification of the pterygo-spinous ligament.

The length-breadth or cephalic index of eight males ranged from 80.1 to 72; one skull was brachycephalic, 80.1; three were between 77.5 and 79.9; one only was dolichocephalic and three ranged from 75.4 to 76.6. The mean was 76.6, which places the series in the mesaticephalic group. The cephalic index of the female was 79.6.

The length-height or vertical index ranged in the males from 75.4 to 67.2, and the mean of the group was 71.7. The parieto-squamous diameter exceeded the basi-bregmatic in each specimen, so that the cephalic index was greater than the vertical.

The projection of the upper jaw, as estimated by the gnathic index, ranged from 102.4 to 87.5, and the mean of the series was 94.6. The average index was therefore orthognathic, and only three specimens were mesognathic. In each specimen the nose was narrow or leptorhine, and the mean of the series was 43. The orbital index ranged from 91.9 to 79.5; the mean of the series was 85, *i.e.*, mesoseme. Of the eight males three were megaseme, one was mesoseme, whilst four were microseme. The palato-alveolar index could only be determined in five males, the mean of which was 109.8, *i.e.*, on the verge of being mesuranic; but three of the skulls were dolichuranic, the other two brachyuranic.

The complete facial index could only be taken in three skulls, which yielded a mean of 93.5, *i.e.*, leptoprosopic, with high and relatively narrow faces; a conclusion as to the character of the face which was borne out in the skulls where the lower jaw was absent, by the proportion of the length of the upper jaw to the interzygomatic breadth, in which the mean maxillo-facial index was 54.6, also leptoprosopic.

The four crania from Lasswade, marked L in Table III., formed a part of the Henderson Trust collection. They were obtained about forty years ago. Three were undoubted



male skulls. The fourth skull was said to be that of a woman. Its dimensions and internal capacity were considerably greater than the average of the female sex; a shallow transverse depression was situated immediately behind the coronal suture, probably due to the wearing in infancy of a band across the head. In its general form this skull corresponded to the crania from Fife, which approached most closely to the brachycephalic character. Two male crania, again, were longer, more capacious, but not so wide, and had a more ovoid form, with dolichocephalic proportions. They were not so well filled, and had a ridge-like elevation in the sagittal region. The glabella was prominent, and the nasion considerably depressed; the bridge of the nose also was moderately projecting. A third male skull, said to be that of a musician in his sixty-seventh year, was much smaller in its dimensions than those just referred to. It possessed a strong glabella and supraorbital ridges, a deep depression at the nasion, a very prominent nose and large nasal bones. It was distinctly dolichocephalic, with an index of 71.7, and in its *norma verticalis* was an elongated ovoid, and not so well filled as the crania previously described. The nasal index was platyrrhine; the orbital index was mesoseme, and the cranial capacity was 1400 c.c. The upper jaw was edentulous, but the denticulations of the cranial sutures were well marked on the outer table. This skull possessed a large left epipteric bone and some small Wormian bones in the lambdoidal suture.

No. 566 was free from Wormian bones, but in 386 a small ossicle was in the coronal and others in the lambdoidal suture. The sutures in 383 were so much ossified that it was impossible to say whether ossicula had at one time been present. None of the Lasswade skulls had a third occipital condyle; in two the under surface of the jugal process was tuberculated: in one were faint indications of an infraorbital suture.

In each of the four crania the vertical index was less than the cephalic; the jaw was orthognathous; the maxillo-facial index was leptoprosopic. In three crania the nasal index was leptorrhine; the orbital index was megaseme; the cranial capacity had the unusual average of 1698 c.c. In all four crania the occipital longitudinal arc was the smallest and the frontal was the longest.

b. The series of crania from a village near the sea coast were mostly from intramural interments, and were found lying loose in the earth below the flooring of a church; two specimens were, however, from graveyard burials. The series is marked I. in Table IV.

This collection of skulls consisted apparently of eight males and seven females, in only one of which the lower jaw was present: several of the specimens were so much broken that only partial measurements could be taken. One skull, a female, was, judging from the dentition and the unossified basi-cranial synchondrosis, between 18 and 20 years. The others were all adults, and at least three specimens were advanced in life. No skull was metopic, but a calvaria, too much broken to be included in the measurements in the Table, had an open frontal suture.

*Norma verticalis*.—Many of the skulls were broadly ovoid. Two females were







more elongated and narrow in proportion to the length; one had a cephalic index 71·5, the other 69·3. Two males and one female, on the other hand, were much wider in proportion to the length, and had a cephalic index between 81 and 82: in one of these (*c*) the width of the skull, 157 mm., was strikingly marked, being one of the broadest measured in this investigation. The skulls generally were well filled, the parietal eminences were not protuberant, as a rule no sagittal ridge, and with the vertex rounded in the vertical transverse arc. The side walls were usually not vertical, but were convex in the squamous regions. In the female crania the frontal eminences were moderately prominent. In the few skulls in which it could be measured, the interzygomatic diameter exceeded the intermalar, stephanic and asterionic. In eight specimens the stephanic diameter exceeded the asterionic: in four the reverse was the case: in two they were equal: with one exception the greatest breadth was in the squamous region. The crania were cryptozygous. In one skull the occipital longitudinal arc was the longest, in one the parietal was the shortest, in three it was the longest, but in the greater number the frontal arc was the longest.

*Norma lateralis.*—In the female skulls the forehead approached the vertical. In the males it receded somewhat, and the glabella and supraorbital ridges were distinctly marked. In the skulls generally, the slope in the parieto-occipital region was moderate, but in the specimens whose proportions were brachycephalic it was more abrupt, and in the skull *d* (cephalic index 81·7) the occipital squama did not project behind the inion, and had a slope upwards and forwards not unlike that seen in the well known Neanderthal skull. Most of the skulls rested behind on the conceptacula cerebelli. The nasal bones were well formed, as a rule moderately projecting, but in *h* more strongly so, and the bridge usually was slightly concave upwards. Except where the glabella was most marked, the nasion was not depressed. As a rule the maxillo-nasal spine was well seen, and a sharp edge separated the floor of the nose from the incisive surface of the superior maxilla. The crania were remarkably free from sutural bones, which showed themselves but seldom in the lambdoidal suture as small denticles; two specimens had small epipteric bones in the pterion. On the right side of *b* the squamous-temporal articulated by a broad tongue directly with the frontal, an arrangement which was obviously due to the fusion of a large epipteric bone with the squamous-temporal. There was considerable variety in the breadth of the alisphenoido-parietal articulation. No third condyle or par-occipital process was seen, but the jugal process was frequently tuberculated. The infraorbital suture had disappeared.

Six of these crania were 190 mm. or upwards in glabello-occipital diameter, and one reached 200 mm. Eight exceeded 140 mm. in greatest breadth, and of these three were 150 mm. or upwards. Six crania had the cephalic index below 75, were dolichocephalic; three were between 75 and 76·9, approximating to the dolichocephalic numerical standard; three were above 80, brachycephalic, and two were 77·5 and 78·1 respectively, *i.e.* approximating to the brachycephalic group. The lowest vertical index was 64, and the highest was 73·2, and in each skull this index was less than the cephalic.



In seven males the mean horizontal circumference was 538 mm., and the mean vertical transverse circumference was 439·8, whilst in five males the mean longitudinal circumference was 520 mm. One skull was mesognathous, the six others capable of being measured were orthognathous. In each skull the nasal index was leptorhine; five orbits were megaseme, two were mesoseme, one microseme. Two skulls had hyperdolichuranic palates, two dolichuranic, one hyperbrachyuranic, two mesuranic. The complete facial index could not be obtained, but as the maxillo-facial index was in each specimen leptoprosopic the proportions for the entire region were without doubt high-faced.

c. The skulls obtained from interments either in Edinburgh or Leith were thirty-three in number, and many of them belonged to the collection of the Henderson Trust. Nine are referred to in WILSON'S *Prehistoric Annals of Scotland*,\* and of these six were obtained in 1832 in the course of excavating the site of the Law Courts which were built on ground which had at one time been a city cemetery, situated between St Giles' Church and the Cowgate. It was probably some time after the Reformation before this was disused as a place of burial. One skull was found at the top of the Vennel whilst digging the foundations of a school on the site of the old wall built after the battle of Flodden, and another was procured in 1830 on the northern slope of the Castle Hill. Two skulls were found in 1854 at St Leonard's Hill, where at one time there is believed to have been a cemetery. Nine skulls came from Leith, and were obtained in 1831 in the course of making an excavation in Constitution Street.† It was thought at the time that they might be the remains of persons who fell at the siege of Leith by the English in 1559, but from the appearance of the skulls it is not likely that they are so old. As a part of Constitution Street was carried through the churchyard of South Leith, they had probably been interred there at a more recent period. Fourteen skulls belonged to the University collection. Two were obtained from beneath the pavement of St Giles' during the course of the recent remodelling of its interior; a third was presented by Sir ARTHUR MITCHELL, and had been procured in the grounds of St Roque, which at one time had been the site of an old ecclesiastical establishment. Nine were obtained in the course of recent excavations which interfered with the former burying-ground of the Kirk o' Field; one was found in digging the foundations of the Solicitors' Library, and one was from a disused burial-ground.

This series of thirty-three crania from burial-grounds in Edinburgh and Leith exhibited differences in form and proportions, which is only what might be expected from the mixing of nationalities in large centres of population, especially when one is a seaport town.

I have regarded nineteen crania as males and fourteen as females, and of the latter one (H.T. 408) was about ten years old, judging from the dentition. The lower jaw was absent in the majority of the skulls. Five crania were metopic, and in some others the frontal suture was not fully obliterated near the nasion. In several specimens the

\* 1851, pp. 166, 176.; also *Phrenological Journal and Miscellany*, vol. viii. p. 185.

† *Phrenological Journal and Miscellany*, vol. vii. p. 287.



sutures of the vault were to a large extent obliterated. Three were edentulous or nearly so. In several the facial bones were broken away and the condition of the teeth could not be ascertained. Wormian bones were present in eleven crania in the lambdoidal suture; one had a fontanelle bone behind the bregma. Two crania had epipteric bones on both sides; four on one side only. One had a normal left pterion, but on the right side a broad tongue-like process of the squamous-temporal articulated with the frontal bone. No skull had a third occipital condyle or a par-occipital process, though occasionally the jugal process was tuberculated on its under surface; a complete pterygo-spinous foramen was not present, but in one specimen a process from the external pterygoid almost reached the spine of the sphenoid.

In five male crania the glabella and supraorbital ridges were well marked, but in the others they were moderate. The forehead as a rule had only a slight backward slope. The vertex was not ridged in the sagittal region, and in the majority the slope outwards to the parietal eminences was not steep, and the skulls had a well filled appearance. Many of the specimens sloped rapidly downwards and backwards in the parieto-occipital region, and in these crania the *norma verticalis* had a broadly ovoid outline. In others again the curve was much longer and the skulls were elongated and ovoid. In the hyperdolichocephalic skull, H.T. 406, the occipital squama projected considerably behind the inion and superior curved line. H.T. 32 and 412, which I have regarded as female skulls, showed a broad transverse depression immediately behind the coronal suture, probably produced by wearing a band across the head during infancy and early childhood.

More than one half of the skulls possessed considerable breadth both absolutely and relatively to the length, and eighteen crania had a length-breadth index of 77.5 and upwards. In eight of these the index was upwards of 80 and in two was above 85, *i.e.*, hyperbrachycephalic. These crania were therefore either brachycephalic or in the highest term of the mesaticephalic group, and this character was shown not only by their numerical proportions but by their general configuration.

Seven crania had a length-breadth index below 75, one of which was as low as 69.8, whilst six skulls ranged from 75 to 77.4. Less than one half were dolichocephalic, or in the lower term of the mesaticephalic series, and of these one was hyperdolichocephalic.

The vertical index in one skull was the same as the cephalic index; in the others it was less, and in many instances considerably below it. The highest vertical index was 76.0, and the cephalic index of the same skull was 85.4. The lowest vertical index was 64.8, and the cephalic index of the same skull was 69.8. Eleven crania had the vertical index below 70 and were therefore chamæcephalic; two were above 75, hypsicephalic; twelve were between 70 and 75, metriocephalic.

In seven crania the occipital arc was longer than the parietal, in one it was longer than the frontal: in twenty-two the frontal arc was longer than the parietal, but in nine the proportion was reversed. The mean horizontal circumference in the males was 520 mm., in the females 502 mm.: the mean vertical transverse circumference in the males



	Old Cemetery.								Vennel.	Castle Hill.	St. Leonards.		St. Rocque.
	Ht. 30.	Ht. 31.	Ht. 34.	Ht. 35.	Metopic. E.U.A.M.	Ht. 32.	Ht. 33.	E.U.A.M.	Ht. 28.	Ht. 29.	Ht. 47.	Ht. 46.	E.U.A.M.
Collection, . . . .	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Aged.	Ad.	Ad.
Age, . . . . .	M.	M.	M.	M.	M.	F.	F.	F.	F.	M.	M.	F.	F.
Sex, . . . . .	1390	...	1410	...	1505	1270	...	...	...	...	...	1540	1100
Cubic capacity, . . . .	182	180	175	183	184	175	161	169	188	189	194	174	169
Glabella-occipital length, .	126	...	127	132	125	124	120	...	130	...	...	132	122
Basi-bregmatic height, .	69.2	...	72.6	72.1	67.9	70.9	74.5	...	69.1	...	...	75.9	72.2
Vertical Index, . . . .	91	95	94	95	102	95	83	88	102	98	104	94	86
Minimum frontal diameter, . . . .	107	105	115	115	116	105	98	105	112	111	118	122	106
Stephanic frontal diameter, . . . .	111	107	115	101	110	105	105	97	112	118	118	110	100
Asterionic diameter, . . . .	143s.	142s.	148s.	141p.	148s.	138p.	133s.	138p.	142s.	143s.	145s.	153s.	135
Greatest parieto-squamous breadth, . . . .	78.6	78.9	84.6	77.0	80.4	78.9	82.6	81.7	75.5	75.7	74.7	87.9	79.9
Cephalic Index, . . . .	512	524	512	512	538	494	470	486	525	533	542	518	488
Horizontal circumference, .	128	125	125	135	138	128	111	123	128	132	131	132	121
Frontal longitudinal arc, .	115	125	114	122	125	126	107	120	...	...	141	118	112
Parietal, " " " " " "	116	123	116	114	113	104	111	109	...	...	104	110	114
Occipital, " " " " " "	359	373	355	371	376	358	329	352	...	...	376	360	347
Total, " " " " " "	290	300	300	304	313	295	272	295	304	298	310	311	298
Vertical transverse arc, .	127	...	129	118	125	111	109	115	121	133	125	132	111
Basal transverse diameter, .	417	...	429	422	438	406	381	410	425	431	435	443	409
Vertical transverse circumference, . . . .	34	...	32	35	35	31	33	...	...	...	...	33	31
Length of foramen magnum, . . . . .	99	...	93	101	95	92	89	...	98	...	...	99	93
Basi-nasal length, . . . .	93	...	...	...	89	...	...	...	...	...	...	91	93
Basi-alveolar length, . . .	93.9	...	...	...	93.7	...	...	...	...	...	...	91.9	100.
Gnathic Index, . . . . .	492	...	498	507	506	481	451	...	...	...	...	492	471
Total longitudinal circumference, . . . .	130	...	132	...	134	...	...	118	...	...	...	...	...
Interzygomatic breadth, . .	114	...	...	...	118	...	...	101	...	...	...	116	...
Internalar, . . . . .	...	...	...	...	...	...	...	...	...	...	...	...	...
Nasio-mental length, . . . .	...	...	...	...	...	...	...	...	...	...	...	...	...
Complete Facial Index, . .	68	...	...	...	67	...	...	70	...	...	...	66	60
Nasio-alveolar length, . . .	52.3	...	...	...	50.	...	...	59.3	...	...	...	...	...
Maxillo-facial Index, . . .	52	...	...	...	52	...	...	50	...	...	...	...	46
Nasal height, . . . . .	24	...	...	...	23	...	...	24	...	...	...	...	22
Nasal width, . . . . .	46.0	...	...	...	44.2	...	...	48.0	...	...	...	...	47.8
Nasal Index, . . . . .	40	...	...	...	38	...	...	35	...	...	...	38	38
Orbital width, . . . . .	35	...	...	...	37	...	...	34	...	...	...	35	30
Orbital height, . . . . .	87.5	...	...	...	97.4	...	...	97.1	...	...	...	92.1	78.9
Orbital Index, . . . . .	54												







TABLE VII.—*Leith.*

Collection, . . . . .	Metopic. Ht. 36	Ht. 404	Ht. 406	Ht. 414	Ht. 416	Ht. 418	Ht. 408 about 10	Ht. 411	Metopic. Ht. 412
Age, . . . . .	Ad.	Ad.	Aged.	Ad.	Ad.	Ad.		Ad.	Aged.
Sex, . . . . .	M.	M.	M.	M.	M.	M.	F.	F.	F.
Cubic capacity, . . . . .	...	...	1450	1295	...	...	1490	1140	...
Glabello-occipital length, . . . . .	176	180	199	177	179	171	179	171	180
Basi-bregmatic height, . . . . .	126	132	129	132	...	...	125	118	...
Vertical Index, . . . . .	71.6	73.3	64.8	74.6	...	...	69.8	69.0	...
Minimum frontal diameter, . . . . .	97	92	96	96	101	89	93	90	98
Stephanic " " . . . . .	120	114	109	113	110	117	120	102	122
Asterionic diameter, . . . . .	111	110	112	104	116	102	106	102	106
Greatest parieto-squamous breadth, . . . . .	144p.	141s.	139s.	137s.	150s.	135s.	141s.	134s.	134s.
Cephalic Index, . . . . .	81.8	78.3	69.8	77.4	83.8	78.9	78.8	78.4	74.4
Horizontal circumference, . . . . .	510	515	546	508	517	490	514	490	512
Frontal longitudinal arc, . . . . .	124	124	133	120	121	125	132	120	120
Parietal " " . . . . .	121	123	130	123	114	114	122	108	128
Occipital " " . . . . .	112	112	120	112	116	...	115	109	104
Total " " . . . . .	357	359	383	355	351	...	369	337	352
Vertical transverse arc, . . . . .	300	298	297	297	314	296	297	278	297
Basal transverse diameter, . . . . .	118	124	120	119	132	113	120	118	111
Vertical transverse circum- ference, . . . . .	418	422	417	416	446	409	417	396	408
Length of foramen magnum, . . . . .	36	34	35	33	...	...	30	34	...
Basi-nasal length, . . . . .	95	101	105	101	...	...	92	88	...
Basi-alveolar length, . . . . .	...	...	...	86	...	...	89	84	...
Gnathic Index, . . . . .	...	...	...	85.1	...	...	96.7	95.4	...
Total longitudinal circum- ference, . . . . .	488	494	523	489	...	...	441	459	...
Interzygomatic breadth, . . . . .	...	131	132	133	...	...	123	125	115
Intermalar, . . . . .	...	114	120	119	...	...	108	110	103
Nasio-mental length, . . . . .	...	...	...	...	...	...	...	...	...
Complete Facial Index, . . . . .	...	...	...	...	...	...	...	...	...
Nasio-alveolar length, . . . . .	...	...	...	67	...	...	70	60	67
Maxillo-facial Index, . . . . .	...	...	...	50.3	...	...	56.9	48.	58.
Nasal height, . . . . .	...	52	50	47	...	...	52	44	48
Nasal width, . . . . .	...	22	24	21	...	...	22	...	21
Nasal Index, . . . . .	...	42.3	48.0	44.7	...	...	42.3	...	43.8
Orbital width, . . . . .	...	38	40	39	...	...	37	39	38
Orbital height, . . . . .	...	31	33	30	...	...	37	31	35
Orbital Index, . . . . .	...	81.6	82.5	76.9	...	...	100.	79.5	92.1
Palato-alveolar length, . . . . .	...	...	...	48	...	...	50	47	55
Palato alveolar breadth, . . . . .	...	...	...	...	...	...	54	...	52
Palato-alveolar Index, . . . . .	...	...	...	...	...	...	108.	...	94.5



was 425·8, in the females 409 mm. : the mean longitudinal circumference in the males was 499, in the females 478 mm.

In many of the skulls the upper jaw was injured, but in fourteen the gnathic index could be computed. With one exception, in which it reached 100, this index was below 98, orthognathous. Eighteen crania admitted of nasal measurements, and in only two specimens did the nasal index reach 48, so that the nose was leptorhine. In twenty crania the orbital index was obtained; in nine it was above 89, *i.e.*, megaseme; in eight it was below 84, microseme; in the others it was intermediate, *i.e.*, mesoseme.

In ten skulls the palato-alveolar index was computed; two were hyperdolichuranic; one was dolichuranic; one was brachyuranic; three were hyperbrachyuranic; the remainder between 110 and 115 were mesuranic.

The complete facial index could only be computed in three skulls, in two of which it was upwards of 90, high faced or leptoprosopic. This character of the face was supported by the measurements of thirteen skulls in which the maxillo-facial index was computed, in all of which, with one exception, it was leptoprosopic.

The cranial capacity could be taken in only eighteen skulls; in eight males it ranged from 1295 to 1505, with a mean 1396·2 c.c. : in nine adult females from 1100 to 1540, with a mean 1291·6 c.c.

#### *Linlithgowshire.* TABLE VIII.

The collection contains only three skulls from West Lothian; one was from Linlithgow, one from South Queensferry, and a third from the eastern border of the county. They are all adults; one is a male, two are females. Although too few in number on which to base a general statement, their more salient characters may be noted.

The female skulls were broadly ovoid in the *norma verticalis*, the vertex was flattened, the forehead smooth, in one almost vertical, in the other somewhat retreating. In one the frontal bone was metopic and marked with grooves, running upwards from the supraorbital foramina; there was no parieto-occipital flattening in either. The cephalic index was 79·4 and 82·7, brachycephalic in form, though one was fractionally below the numerical standard of that group. The vertical index in both was less than the cephalic. The face was orthognathous, and the maxillo-facial index was leptoprosopic. The anterior nares were relatively wide in one in which the nasal index was mesorhine, but in the other it was leptorhine; the orbits were mesoseme and microseme respectively, and the palato-alveolar arch was mesuranic and brachyuranic. The skulls showed no unusual ossifications.

The male skull was an elongated ovoid in the *norma verticalis*. The vertex was not ridged, low-arched and with a gentle slope from the sagittal suture to the parietal eminences. The glabella and supraorbital ridges were moderate, the forehead was only slightly retreating. There was no parieto-occipital flattening. The skull was cryptozygous, 200 mm. in greatest length, 145 mm. in breadth, with a cephalic index 72·5; the







vertical index, 71, was less than the cephalic. The occipital arc was longer than the frontal and parietal. The nasion was not depressed; the nasal bridge was moderately projecting; the maxillo-nasal spine was distinct, and a sharp ridge separated the floor of the nose from the incisive region. The upper jaw was orthognathous; the maxillo-facial index was leptoprosopic; the nose was elongated and leptorhine; the orbits were mesoseme. The skull had the massive character, with the ample dimensions which one sees in so many adult Scotchmen. Except that the hard palate was deeper than usual, the skull showed no special variations in ossification.

*Stirlingshire.* TABLE VIII.

Two crania were found in a moss at Kilsyth; one belongs to the Henderson Trust collection, No. 27; the other to the Ballingall collection in the University Museum. They are both stained almost black by the peat in which they were lying, and they are injured as if from swordcuts received in battle. The skull in the Henderson Trust collection is referred to in WILSON'S *Prehistoric Annals*. They were adult males, and one was metopic.

*Norma verticalis*.—One cranium was rounded in outline and brachycephalic, with the cephalic index 83·8; the other was a little more elongated, and the index was 78·1. In both, the basi-bregmatic diameter was much below the parieto-squamous breadth. The vertex was flattened, the slope outwards to the parietal eminences was gentle and the side walls were somewhat bulging; the parieto-occipital slope was abrupt, but the occipital squama was not flattened.

*Norma lateralis*.—The glabella and supraorbital ridges were distinct but not specially prominent; the forehead was only slightly retreating. The bridge of the nose was moderately projecting; the nasal floor was separated from the incisive region by a definite crest. In the brachycephalic skull the nasal index was mesorhine, the orbital index microseme, the gnathic index mesognathous, the palato-maxillary index brachy-uranic; the complete facial and maxillo-facial indices were chamæprosopic. In the other skull the corresponding indices were leptorhine, megaseme, orthognathous, brachyuranic and leptoprosopic.

*Lanarkshire.* TABLE VIII.

The collection contains two skulls from this county, one from the parish of Bothwell and the other from New Lanark. They were both males; the Lanark skull was advanced in years; in the Bothwell specimen the sutures were undergoing obliteration.

*Norma verticalis*.—Both were elongated ovoids, not specially flattened on the vertex, sloping downwards to the parietal eminences and with vertical sides. Both were good examples of dolichocephalic crania; but the length of the skull from New Lanark, 201 mm., was promoted by the Wormian bones in the lambdoidal suture being



set obliquely, so that the occipital squama formed a shelf-like projection. The shelf added several millimetres to the absolute length of the skull and influenced the cephalic index, the total longitudinal arc and the longitudinal circumference. The Museum contains other four crania not described in this memoir, two of which were obtained in the dissecting-room, in which a similar shelf-like character is present.

In both the Lanarkshire skulls the basi-bregmatic height was below the greatest breadth. In both the face was orthognathic and leptoprosopic; the nose was leptorhine, the orbit was megaseme; in the Bothwell specimen the palato-alveolar arch was brachyuranic.

*Peeblesshire.* TABLE VIII.

Three imperfect adult and apparently female skulls from this county are in the collection; one from Linton (H.T. 40) was found in a moss, but it is not peat-stained; the two others are from the parish of Wiston. In one skull the length-breadth index was hyperbrachycephalic, 85·6; in the two others in the higher mesaticephalic group, 78. In all three the basi-bregmatic diameter was materially below the parieto-squamous breadth. The cranial measurements were on a small scale, indicative of the sex. The face in each skull was so much injured that the facial measurements could not be taken.

*Roxburghshire.* TABLE VIII.

The collection contains two skulls which were obtained in Butts Lane, Kelso, in 1864, during the construction of a system of sewage. One belonged to a skeleton lying at full length in a grave formed of slabs of stone loosely placed together. The other was got in close proximity to this grave, but the finder could not tell me if it were in a similar grave, or was in a collection of human bones unenclosed in coffins in the surrounding earth. One was that of a man advanced in years, with the alveolar arch absorbed; the other was apparently that of a woman.\*

In their general form, as seen from the *norma verticalis*, the crania were elongated ovoid, with somewhat bulging side walls, with no sagittal ridge, with the postero-parietal region steep, and with a convex occipital squama. The proportions of length and breadth were almost identical; the cephalic index, 76·2 and 76·3 respectively, was in the lower mesaticephalic group. In each skull the basi-bregmatic height was much less than the greatest breadth. In the female the face was orthognathous, leptoprosopic, leptorhine, megaseme, and hyperdolichuranic; in the male the corresponding indices, so far as they could be computed, were mesorhine and mesoseme. In each skull the cranial capacity was more than 1500 c.c.

\* A description of the find is given by me in *Proc. Scot. Soc. Antiquaries*, June 1865, vol. vi. p. 245.



*Renfrewshire.* TABLES IX., X. PLATES II., III., V.

Twenty-one skulls from Renfrewshire, including the town of Paisley, were examined; eleven were apparently males and ten females. The majority were in adult life; one was about twenty years of age; several, to judge either from the obliteration of the sutures of the cranial vault, or the loss of teeth and the absorption of the alveoli, or from the presence of both these conditions, were advanced in years. Three skulls were metopic.

*Norma verticalis.*—The crania were not uniform in appearance; six were relatively broadly ovoid, whilst the rest were more elongated in relation to the breadth. As a rule the vertex was low and rounded in the transverse arc, and sloped gently outwards to the parietal eminences; but in three specimens the sagittal line was somewhat ridged, and the slope outwards from it was more abrupt. The side walls were slightly bulging, and the greatest breadth was near the squamous suture; in each skull the greatest breadth exceeded the interzygomatic diameter. The relative diameter in the stephanic and asterionic regions varied in different skulls. There was no parieto-occipital flattening, but the skulls varied in the slope of that region, and in the amount of projection of the occipital squama. The crania were cryptozygous.

*Norma lateralis.*—In the males the glabella and supraorbital ridges were distinct, and the forehead sloped backwards, in some slightly, in others to a greater extent. In the females the forehead approached the vertical, and the region of the frontal air sinuses was relatively smooth. The bridge of the nose was usually prominent and frequently concave upwards. The nasion was depressed in only three male skulls. The maxillo-nasal spine was distinct, sometimes very prominent, and a sharp ridge separated the floor of the nose from the incisive region of the upper jaw. In one skull the longitudinal occipital arc was longer than either the frontal and parietal, in one longer than the frontal, in one longer than the parietal; there was no constancy in the relative length of the frontal and parietal arcs.

In the male crania the glabello-occipital length ranged from 180 to 201 mm., and the mean was 190 mm.; the breadth ranged from 130 to 153 mm., with a mean 142·8 mm.; the basi-bregmatic diameter ranged from 121 to 143 mm., and the mean was 133·5 mm. The mean horizontal circumference was 531 mm.; the mean vertical transverse circumference was 429·9 mm.; the mean longitudinal circumference was 523 mm. In the female crania the corresponding dimensions were as follows:—Range of glabello-occipital diameter from 169 to 188 mm., with the mean 177 mm.; the breadth ranged from 130 to 142 mm., with a mean 135·7; range of basi-bregmatic diameter from 121 to 133 mm., with the mean 127 mm.; mean horizontal circumference 501·6, mean vertical transverse circumference 406, the mean longitudinal circumference 489·9. In the males the cranial capacity ranged from 1230 to 1855 c.c., with the mean 1526 c.c.; in the females the range was from 1180 to 1490 c.c., and the mean was 1300·5 c.c.







TABLE X.—*Renfrewshire, including Paisley. Females.*

Collection number, . . .	C.	D.	E.	F.	O.	P.	Q.	R.	Metopic.	T.
Age, . . . . .	Ad.	Ad.	Ad.	Ad.	Aged.	Ad.	abt. 20	Ad.	S.	Aged.
Sex, . . . . .	F.	F.	F.	F.	F.	F.	F.	F.	F.	F.
Cubic capacity, . . . . .	1330	1230	1375	1250	1200	1180	1490	1310	...	1340
Glabello-occipital length, . . .	188	169	180	188	171	176	178	172	176	180
Basi-bregmatic height, . . .	126	125	123	128	121	126	133	129	...	131
Vertical Index, . . . . .	67·	74·	68·3	68·1	70·8	71·6	74·7	75·	...	72·8
Minimum frontal diameter, . . .	91	88	89	91	92	87	85	93	92	88
Stephanic diameter, . . . . .	109	100	111	111	103	99	101	102	105	105
Asterionic diameter, . . . . .	109	105	108	113	114	95	112	100	110	112
Greatest parieto - squamous breadth, . . . . .	140p.	132	136	136	136(s.)	130s.	142s.	134(p.)	133(s.)	138s.
Cephalic Index, . . . . .	74·5	78·1	75·6	72·3	79·5	73·9	79·8	77·9	75·6	76·7
Horizontal circumference, . . .	523	486	507	517	483	488	508	490	505	509
Frontal longitudinal arc, . . .	135	114	123	125	117	113	125	118	123	129
Parietal " " " " " " " "	239	122	128	243	109	123	123	132	126	126
Occipital " " " " " " " "		107	119		118	119	121	98	...	118
Total " " " " " " " "	374	343	370	368	344	355	369	348	...	373
Vertical transverse arc, . . . .	295	284	300	289	280	275	300	290	286	302
Basal transverse diameter, . . .	121	119	112	114	118	110	119	113	119	114
Vertical transverse circumference, . . .	416	403	412	403	398	385	419	403	405	416
Length of foramen magnum, . . .	34	36	35	33	30	37	39	33	...	31
Basi-nasal length, . . . . .	101	92	87	100	94	93	93	100	...	97
Basi-alveolar length, . . . . .	102	89	79	93	...	93	85	98	...	...
Gnathic Index, . . . . .	101·	96·7	90·8	93·	...	100	91·4	98·	...	...
Total longitudinal circumference, . . .	509	471	492	501	468	485	501	481	...	501
Interzygomatic breadth, . . . .	...	116	120	123	122	116	120	119	122	120
Intermalar " " " " " " " "	...	102	106	107	108	100	104	105	105	106
Nasio-mental length, . . . . .	...	...	...	...	...	...	...	...	...	...
Complete Facial Index, . . . . .	...	...	...	...	...	...	...	...	...	...
Nasio-alveolar length, . . . . .	70	68	66	71	...	72	60	67	74	...
Maxillo-facial Index, . . . . .	...	58·6	55·	57·7	...	61·8	50·	54·7	60·6	...
Nasal height, . . . . .	49	51	49	55	52	54	46	46	54	50
Nasal width, . . . . .	...	22	21	22	21	21	21	21	19	24
Nasal Index, . . . . .	...	43·1	42·9	40·	40·4	38·9	45·7	45·7	35·2	48·
Orbital width, . . . . .	39	35	37	38	36	37	36	36	38	36
Orbital height, . . . . .	35	34	36	36	33	32	29	31	35	32
Orbital Index, . . . . .	89·7	97·1	97·3	94·7	91·7	86·5	80·6	86·1	92·1	88·9
Palato-alveolar length, . . . . .	59	48	48	51	...	52(ap.)	47	55	57	...
Palato-alveolar breadth, . . . . .	61	60	57	...	...	61	60	58	60	...
Palato-alveolar Index, . . . . .	103·4	125·	118·7	...	...	117·3	127·6	105·4	105·2	...



The relative proportions of the cranium and of the face, as determined by their respective indices, in the two sexes, were as follows:—The length-breadth index ranged from 70·7 to 79·8, and the mean of twenty-one crania was 75·7; eight crania were between 70·7 and 74·9, *i.e.* were dolichocephalic; seven were from 75·6 to 76·7, *i.e.* in the lower half of the mesaticephalic group, and approached therefore to the dolichocephalic; six were from 77·6 to 79·8, *i.e.* approached the brachycephalic, and of these three almost reached the index of 80. The mean vertical index was 70·7, and in each skull the basi-bregmatic height was less than the greatest breadth. The mean gnathic index of thirteen skulls was 94, *i.e.* orthognathous, but in three of these the index was higher, mesognathous. The mean nasal index was only 43·5, so that the narrow, elongated, leptorhine nose was well pronounced; only two specimens exceeded 48, and were in the lower mesorhine group. The rounded form of the orbit generally was shown by the mean megaseme index 89·7, though it should be stated that in three crania the index was in the microseme group. The mean palato-alveolar index was 113, *i.e.* mesuranic; the range in the index was considerable, for ten specimens were dolichuranic; two were hyperdolichuranic; two were hyperbrachyuranic, four were brachyuranic, and only four were mesuranic; the mean mesuranic index did not represent the proportions in individual skulls, but the mean between the extreme proportions. From the absence of the lower jaw, or from the changes due to alveolar absorption, the complete facial index was only obtainable in three specimens, in all of which the index was leptoprosopic or high faced. It was possible to compute in thirteen specimens the maxillo-facial index, or the proportion between the interzygomatic diameter and the height of the upper jaw, the mean of which index was 57·4, which places them high in the leptoprosopic group. In only one specimen was the index as low as 50.

The sutures, when not obliterated, had as a rule well-marked denticulations, and sutural bones were infrequent. In one specimen a small interparietal bone was seen, three had small Wormians in the lambdoidal suture, one had an anterior fontanelle bone, one a small sutural bone in the left half of the coronal suture, one a small sutural bone in the squamous suture. One skull had a left epipteric bone, two had each a right epipteric, and in one skull the squamous-temporal articulated with the frontal on the left side and almost did so on the right side. In more than one the alisphenoid had a very narrow articulation with the parietal. No skull had a third condyle or par-occipital process, though in some the jugal process was tuberculated; in one, each occipital condyle was transverse, divided into two facets; in another a pair of short, sharp tubercles projected downwards from the basi-occipital antero-internal to the condyles.

#### *Ayrshire.* TABLE XI.

Three crania were obtained from the county of Ayr. One, No. 24 in the Henderson Trust collection, was from Kirk Alloway, the others were from intramural interments



in the town of Ayr. They were all adults; one was a male, the others apparently females.

In the *norma verticalis* two were seen to be elongated ovoids, whilst the third was more rounded in form. They were all low arched at the vertex, but they varied in the steepness of the slope from the sagittal suture to the parietal eminences. The side walls of the cranium were slightly bulging. In the more elongated crania, the backward slope from the squamous suture to the projecting occipital squama was so marked as to give a distinct pentagonal outline to the cranium. They were cryptozygous. The diameter in the parieto-squamous region was almost the same in each, but one skull was absolutely so short as to be brachycephalic, whilst in the others the cephalic index was 75 and 75·9 respectively. In each skull the vertical index was materially below the cephalic.

In the male skull the glabella and supraorbital ridges were distinct, the forehead was somewhat retreating, and the nasion was depressed. In the females these characters were much less pronounced. In one the nose was prominent, in the other less so, and the floor was separated from the incisive region by a sharp ridge. Two skulls were orthognathous, one mesognathous, and the face was leptoprosopic; two skulls were leptorhine, one mesorhine; in two the orbits were megaseme, in one microseme, in two the palate was brachyuranic, in one hyperbrachyuranic.

One female skull was metopic, in the other the sagittal and lambdoidal sutures were almost obliterated; no Wormian or epipteric bones were present. A third condyle was not present, but in two the jugal process was tuberculated on its inferior surface.

#### Wigtonshire. TABLE XI. PLATE III.

Four skulls in the collection are from Kirkmadrine, Wigtonshire. From the conditions under which they were found there is reason to believe that they were from interments made more than a century ago. They doubtless represent the cranial characters of the people of Galloway of that period. They were adult crania, two apparently males and two females.

*Norma verticalis*.—They were elongated and ovoid, and in no instance was the breadth proportionally large in relation to the length. The vertex was somewhat rounded in the transverse arc, there was no sagittal ridge, and the slope outwards to the parietal eminences was gentle. In two crania the side walls were nearly vertical, in the other two they were somewhat bulging. The parietals sloped downwards behind the obelion, and the occipital squama was convex backwards. The crania were cryptozygous. In the two men the parieto-squamous exceeded the interzygomatic diameter. In two skulls the stephanic exceeded the asterionic, in the other two the proportions were reversed.

*Norma lateralis*.—In the men the glabella and supraorbital ridges were distinct; in the women they were feeble; in all the forehead slightly retreated and the arch of







the vault was flattened. The nose was moderately prominent, and in a male the nasion was depressed; the maxillo-nasal spine was distinct, and the floor of the nose was separated from the incisive region by a crest. The occipital longitudinal arc was in each skull the shortest; in two the frontal arc was the longest, in two the parietal exceeded the frontal.

The male crania in the glabello-occipital diameter were 198 and 187 respectively, the female 181 and 182; the basi-bregmatic diameter in the men was 131 and 129, in the women 124 and 119 mm. The maximum parieto-squamous diameter was 146 mm., the minimum (a female) 130 mm., and the mean in the men was 144.5, in the women 134 mm. In the two men the mean horizontal circumference was 538 mm., the mean vertical transverse circumference was 430; the mean longitudinal circumference was 519 mm.; the mean cubic capacity was 1570 c.c.

The cephalic index in the four crania ranged from 71.8 to 76.5 and the mean was 74.4; the skulls may be regarded as dolichocephalic, though two slightly exceeded the upper limit of that group. The mean vertical index was 67.2, and in each skull the basi-bregmatic height was less than the greatest breadth. The mean gnathic index was orthognathous, though one female skull slightly exceeded the upper limit of that group. The complete facial index was 55.3, high-faced or leptoprosopic. One nasal region had a low mesorhine index, the others were leptorhine. One orbit was microseme, two mesoseme, one megaseme. In two skulls the palato-alveolar index was brachyuranic, in two hyperbrachyuranic.

With the exception of small Wormian bones in the lambdoidal suture in two skulls, and very simple sutures of the vault in a female skull, no special variations in the ossification were observed.

#### *Forfarshire.* TABLE XII.

The collection of the Henderson Trust contains two skulls (H.T. 37, 39), both of which were found in 1833 under the foundation of the steeple of the old church in Montrose. No. 37, referred to in the *Prehistoric Annals of Scotland*, is a large male skull which, judging from the cranial sutures, is of a person advanced in years; the facial bones are broken away. No. 39 is of much smaller capacity, with the alveolar arcade absorbed, but with the sutures distinct; it is apparently a male.

*Norma verticalis.*—No. 37 was rounded in outline and flattened in the parieto-occipital region. No. 39 was more elongated and with the occipital squama convex. They were both flattened on the vertex, and sloped gently from the sagittal suture to the parietal eminences, with the side walls slightly bulging. No. 37 was hyperbrachycephalic, with cephalic index 87.2; No. 39 closely approached an index of 80. In both the basi-bregmatic diameter was much below the greatest breadth.

In both the glabella and supraorbital ridges were only feebly projecting; the forehead only slightly receded. In No. 39 the nasion was not depressed, and the bridge of



the nose had scarcely any projection; the nasal index was leptorhine. The orbits were rounded, megaseme. The absence of a lower jaw and the absorption of the maxillo-alveolar arcade prevented the facial proportions from being taken.

*Banffshire and Kincardineshire.* TABLE XII.

The skull from Banff is from the village of Gamrie, but I have no record of the conditions under which it was found; from its appearance, I judge it to have been buried for a considerable period. It was a male, somewhat advanced in years.

In the *norma verticalis* the outline was broadly ovoid, flattened on the vertex, sloping gently outwards to the parietal eminences; the postero-parietal region sloped downwards and backwards, but the occipital squama was convex. The cephalic index, 80·3, was brachycephalic; the basi-bregmatic height was much below the greatest breadth.

The glabella and supraorbital ridges were well marked, the forehead was somewhat retreating, the bridge of the nose was injured, but the part remaining had not much projection; the nasal index was leptorhine; the orbits were megaseme; the face was broad, but the absence of the lower jaw and the broken maxillo-alveolar arch prevented me from obtaining the proportions of the face. The cranial capacity, 1630 c.c., was much above the average of Europeans.

Some years ago I had the opportunity of seeing several skulls from the parish of Fordoun in Kincardineshire. They were so imperfect that very few measurements could be taken, and in only three specimens was it possible to obtain the relation of length to breadth; the cephalic index ranged from 79·9 to 84, so that they were of the brachycephalic type. They were apparently male skulls, and although their internal capacities could not be taken, it would seem from the external dimensions that *a* and *b* had possessed a good amount of brain space. The glabella and supraorbital ridges were moderate, the forehead only slightly retreated; in *a* the vertex was somewhat ridged, but in *b* and *c* not so. The postero-parietal region was flattened from above downwards and backwards, but the occipital squama was convex; *b* had several Wormian bones in the lambdoidal suture.

*Caithness.* TABLE XII.

The collection contains three crania from Caithness; one, H. T. No. 45, was found at Knockstanger, on the site of a battle fought between the Mackays and Sinclairs in 1437: it is referred to in WILSON's *Prehistoric Annals of Scotland*. A second, perhaps from the same locality, was originally in the collection of Professor Alexander Monroe, *tertius*, and it has the characters of a female skull. A third skull, a female, was from the "Burial Mound" at Keiss, and formed one of a series excavated by Mr Samuel Laing



TABLE XII.—*North-Eastern Counties.*

	CAITHNESS.			BANFF.	KINCARDINESHIRE.			FORFARSHIRE.	
	Knockstanger.	Keiss.		Gamrie.	Fordoun.			Montrose.	
Collection number, . . .	Ht. 45.	B. 17.	E.U.A.M.	E.U.A.M.	A.	B.	C.	Ht. 37.	Ht. 39.
Age, . . . . .	Ad.	Ad.	Ad.	Ad.	Ad.	Aged.	Ad.	Aged.	Aged.
Sex, . . . . .	M.	F.	F.	M.	M.	M.	M.	M.	M.
Cubic capacity, . . .	...	1285	1460	1630	...	...	...	...	1240
Glabello-occipital length, .	192	182	183	188	184	180	175	180	182
Basi-bregmatic height, . .	130	127	130	139	...	126	...	140	117
Vertical Index, . . . .	67·7	69·8	71·0	73·9	...	70·	...	77·8	64·3
Minimum frontal diameter, .	98	95	88	102	106	103	98	106	97
Stephanic diameter, . .	105	111	101	125	111	120	106	126	...
Asterionic diameter, . .	114	114	114	108	130	...	...	116	105
Greatest parieto - squamous breadth, . . . . .	142s.	136s.	134	151s.	147	144	147	157	145s.
Cephalic Index, . . . .	74·	74·7	73·2	80·3	79·9	80·	84·	87·2	79·7
Horizontal circumference, .	535	510	513	544	542	525	...	540	523
Frontal longitudinal arc, .	120	130	120	138	130	{ 247	...	142	130
Parietal " " . . .	124	120	128	133	{ 244		117	148	104
Occipital " " . . .	124	124	123	129			101	94	126
Total " " . . .	368	374	371	400	374	348	...	384	360
Vertical transverse arc, . .	293	288	294	336	320	...	...	326	295
Basal transverse diameter, .	127	116	113	127	135	...	...	134	119
Vertical transverse circum- ference, . . . . .	420	404	407	463	455	...	...	460	414
Length of foramen magnum, .	37	32	34	34	...	37	...	33	35
Basi-nasal length, . . .	109	93	97	99	...	105	...	100	91
Basi-alveolar length, . .	...	89	94	...	...	...	...	...	...
Gnathic Index, . . . .	...	95·7	96·9	...	...	...	...	...	...
Total longitudinal circum- ference, . . . . .	524	499	502	533	...	490	...	517	486
Interzygomatic breadth, .	...	...	122	133ap.	...	...	...	...	...
Intermalar " " . . .	...	...	105	121	...	...	...	...	...
Nasio-mental length, . .	...	...	110	...	...	...	...	...	...
Complete Facial Index, . .	...	...	90·1	...	...	...	...	...	...
Nasio-alveolar length, . .	...	69	66	...	...	...	...	...	...
Maxillo-facial Index, . .	...	...	54·	...	...	...	...	...	...
Nasal height, . . . . .	...	47	51	48	...	...	...	...	51
Nasal width, . . . . .	...	22	21	23	...	...	...	...	22
Nasal Index, . . . . .	...	46·8	41·2	47·9	...	...	...	...	43·1
Orbital width, . . . . .	...	39	37	41	...	...	...	...	38
Orbital height, . . . . .	...	38	35	34	...	...	...	...	35
Orbital Index, . . . . .	...	97·4	94·6	82·9	...	...	...	...	92·1
Palato-alveolar length, . .	...	50	53	...	...	...	...	...	...
Palato-alveolar breadth, .	...	58	60	...	...	...	...	...	...
Palato-alveolar Index, . .	...	116	113	...	...	...	...	...	...
Lower jaw. {	Symphysial height, . .	...	27	...	...	...	...	...	...
	Coronoid " " . . .	...	55	...	...	...	...	...	...
	Condylod, " " . . .	...	58	...	...	...	...	...	...
	Gonio-symphysial length, .	...	84	...	...	...	...	...	...
	Inter-gonial width, . .	...	97	...	...	...	...	...	...
Breadth of ascending ramus, . . . . .	...	...	32	...	...	...	...	...	...



and described by Professor HUXLEY.\* They were from persons in the later stage of adult life.

*Norma verticalis*.—The crania were elongated ovoids, with a tendency to be ridged and roof-like in the sagittal region, and sloped distinctly downwards from the sagittal suture to the parietal eminences; they were flattened in the postero-parietal region, and in two the side walls were vertical. In each skull the length-breadth index was below 75 and therefore dolichocephalic; the mean of the series was 73.9. In each skull also the basi-bregmatic diameter was below the greatest breadth. In two crania the occipital longitudinal arc was greater than the frontal but less than the parietal; in two the parietal was greater than the frontal. In the Keiss skull the occipital squama bulged backwards.

The glabella and supraorbital ridges were not very prominent; in the females the forehead was almost vertical, in the male slightly retreating. The nasion was not depressed, the bridge of the nose present in the Keiss cranium was sharp and aquiline, and in it also the maxillo-nasal spine was long, and a distinct crest separated the floor of the nose from the incisive region. In the male Knockstanger skull the face was broken away, but in the other skulls the nasal index was leptorhine; the orbits were megaseme and the upper jaw was orthognathous. In the Keiss specimen the face was leptoprosopic and the palato-alveolar arch was mesuranic, the angle of the lower jaw was gently rounded, and the symphysis was somewhat pointed; in the other female skull the arch was brachyuranic.

*Shetland Islands.* TABLE XIII. PLATES III., IV., V.

Five male skulls were collected in Shetland. Two were from a parish in the north-west of the mainland, one from a parish in its southern part, and two from the neighbourhood of Lerwick. They were from persons in the later stage of adult life. In one the teeth were all shed and the alveoli absorbed, in two others many of the alveoli were absorbed, and in the other two the crowns were worn and flattened. Two crania were metopic, and in all the sutures of the vault were visible in the outer table.

The *norma verticalis* was broadly ovoid, though in two specimens the relative breadth was not so great as in the others. In three the vertex was low-arched from side to side; no sagittal ridge, and the slope outwards to the parietal eminences was gentle; the side walls were somewhat bulging. In one the occipital squama was convex, in the others it

\* See Laing and Huxley's *Prehistoric Remains in Caithness* (London, 1866), in which I gave a detailed description of this skull. Several skulls from this Burial Mound are described by Professor Huxley: they varied in the cephalic index from 70 to 78. The so-called mound was on the natural terrace of sand and shingle parallel and close to the sea beach, and was scarcely elevated above the surface of the terrace. Stones were found in two of the graves which Mr Laing regarded as rude stone implements, and he associated the burials with the early stone period. The bodies had been buried in the extended position in long graves covered with flat stones, whilst the walls were formed of unhewn flagstones, a mode of burial which is known to have prevailed during the Christian era, and examples of which are not uncommon on the sea shore. It is questionable if these burials had the antiquity which Mr Laing has ascribed to them. See also *Proc. Scottish Soc. Antiquaries*, vol. vii. p. 38, 1870.



TABLE XIII.—*Shetland.*

	Northmavine.		St. Ninians.	Lerwick.	
	Metopic. E.U.A.M.	E.U.A.M.	E.U.A.M.	Metopic. E.U.A.M.	E.U.A.M.
Collection number, . . . .	Ad.	Ad.	Ad.	Ad.	Aged.
Age, . . . . .	M.	M.	M.	M.	M.
Sex, . . . . .	1615	1770	1630	1560	1580
Cubic capacity, . . . . .	190	201	189	180	192
Glabello-occipital length, . .	142	141	138	138	140
Basi-bregmatic height, . . .	74.7	70.1	73.0	76.7	72.9
Vertical Index, . . . . .	106	101	103	104	102
Minimum frontal diameter, . .	125	114	125	117	130
Stephanic diameter, . . . .	119	120	120	110	117
Asterionic diameter, . . . .	Greatest parieto - squamous breadth, . . . . .				
	147s.	151s.	150s.	155s.	146s.
Cephalic Index, . . . . .	77.4	75.1	79.4	86.1	76.0
Horizontal circumference, . .	551	568	538	538	544
Frontal longitudinal arc, . . .	139	140	134	119	139
Parietal " " " " " " " "	134	140	123	115	130
Occipital " " " " " " " "	112	127	125	126	126
Total " " " " " " " "	385	407	382	360	395
Vertical transverse arc, . . .	320	337	318	326	333
Basal transverse diameter, . .	125	129	126	130	118
Vertical transverse circum- ference, . . . . .	445	466	444	456	451
Length of foramen magnum, . .	37	36	36	33	29
Basi-nasal length, . . . . .	107	110	103	106	103
Basi-alveolar length, . . . .	...	...	95	97	...
Gnathic Index, . . . . .	...	...	92.2	91.5	...
Total longitudinal circum- ference, . . . . .	529	553	521	499	527
Interzygomatic breadth, . . .	138	140	136	140	...
Intermalar " " " " " " " "	123	125	121	121	...
Nasio-mental length, . . . . .	...	137	120	...	...
Nasio-mental complete facial Index, . . . . .	...	98.	88.2	...	...
Nasio-alveolar length, . . . .	...	...	69	73	74(ap.)
Maxillo-facial Index, . . . .	...	...	50.7	52.	...
Nasal height, . . . . .	58	56	53	57	57
Nasal width, . . . . .	22	24	22	25	23
Nasal Index, . . . . .	37.9	42.8	41.5	43.8	40.3
Orbital width, . . . . .	38	41	41	40	40
Orbital height, . . . . .	34	38	35	37	39
Orbital Index, . . . . .	89.5	92.7	85.4	92.5	97.5
Palato-maxillary length, . . .	...	...	57	55	...
Palato maxillary breadth, . .	...	...	61	...	...
Palato-maxillary Index, . . .	...	...	107.	...	...
Lower jaw.	Symphysial height, . . . .	34	37	29	...
	Coronoid " " " " " " " "	61	72	60	...
	Condylod " " " " " " " "	64	72	57	...
	Gonio-symphysial length, . .	93	105	92	...
	Inter-gonial width, . . . .	...	114	111	...
	Breadth of ascending ramus, . . . . .	40	41	33	...



was more flattened in continuation with the flatness of the parietal region behind the obelion. They were all cryptozygous. The parieto-squamous diameter in each skull exceeded the interzygomatic. With one exception the stephanic exceeded the asterionic diameter.

*Norma lateralis*.—The glabella and supraorbital ridges were well marked; the forehead sloped slightly backward. The nose was prominent and with a strong bridge, moderately concave forwards; the nasion was somewhat depressed; the maxillo-nasal spine was distinct and the floor of the nose was separated from the incisive region by a definite crest. The occipital arc in one skull was longer than the parietal; in another longer than either frontal or parietal; in four skulls the frontal arc exceeded the parietal, in one they were equal.

The crania ranged in glabello-occipital diameter from 180 to 201 mm. and the mean was 190·4 mm.; the basi-bregmatic diameter ranged from 138 to 142 mm., and the mean was 139·8 mm. The maximum parieto-squamous diameter was 155 mm., minimum 146, and the mean was 149·8 mm. The mean horizontal circumference was 547·8 mm., the mean vertical transverse circumference was 452·4, the mean longitudinal circumference was 525·8 mm.; the cubic capacity ranged from 1560 to 1770 c.c., and the mean was 1631 c.c. Both in external dimensions and internal capacity the Shetland skulls were characterised by their magnitude.

The cephalic index ranged from 75·1 to 86·1; one was hyperbrachycephalic, the others were mesaticephalic, though two approached the dolichocephalic standard; the mean of the series was 78·8, *i.e.* mesaticephalic. The mean vertical index was 73·4, and in each skull the basi-bregmatic height was less than the greatest breadth.

Owing to the alveolar absorption, the gnathic index could only be computed in two skulls, in both of which it was orthognathous. In each skull the nose was narrow or leptorhine; in one the orbit was mesoseme, in the others rounded or megaseme. The facial index was in the leptoprosopic or high-faced group.

As regards individual peculiarities, two crania were metopic, one had a large interparietal bone, the left third of which had a separate ossification; three had several small Wormian bones in the lambdoidal suture. One metopic skull had a small left epipteric bone. No skull had a third occipital condyl or par-occipital process, though in two the jugal processes were tuberculated.

#### *Perthshire.* TABLE XIV.

Only one skull has been obtained from this large county. It came from the Bridge of Garry, at the foot of the pass of Killiecrankie. It is that of a man advanced in years, but unfortunately is so much injured that only a few measurements could be taken. The sutures of the cranial vault were ossified, and the teeth were much worn and flattened on the crowns. The cranium in the occipital and right parietal regions was marked with incisions extending through the outer table into the diploë as if from sword



cuts, and it is possible that the man may have been one of the combatants at the battle of Killiecrankie.

Seen in the *norma verticalis* the cranium was greatly elongated, and relatively narrow; the cephalic index was only 69·7, hyperdolichocephalic; the base of the cranium was much broken, and none of the measurements from the basion could be taken.

The glabella and supraorbital ridges were distinct; the forehead only slightly receded; the cranial vault formed a lofty curve; the post-parietal region sloped gently downwards, and the occipital squama was convex.

*Argyllshire.* TABLE XIV. PLATE V.

In the collection of the Henderson Trust are three skulls from Argyllshire; two (Nos. 25 and 26, H. T.) were found near Crutchingman on Loch Tarbert, Kintyre, and one of these is referred to in the *Prehistoric Annals* as having been dug up in a cave, near to where tradition affirms that a battle was fought between the natives and the Northmen. The third skull, H. T. 5, was dug out of the sand on the sea-beach at Larnahinden, where a party of "Danes" are said to have landed and been defeated. No. 25 has the characters of a female skull. They were adults, and with the crowns of the teeth flattened from use.

*Norma verticalis.*—These skulls were elongated ovoids, elevated on the line of the sagittal suture, sloping steeply outwards to the parietal eminences, with vertical sides, with the postero-parietal region sloping gently downwards and the occipital squama convex. The crania were characteristically dolichocephalic, the mean index being 70·6. The basi-bregmatic height was a little less than the greatest breadth. In one, the interzygomatic breadth exceeded the parieto-squamous, in another it was slightly below it.

The glabella and supraorbital ridges were strong in the male skulls, and the nasion was depressed; the bridge of the nose was prominent, and its floor was separated from the incisive region by a crest. The forehead was retreating in the male. In one, the gnathic index was orthognathous; in two, in the lower mesognathic group; in one, the face was leptoprosopic, in another chamæprosopic. In all three the nose was leptorhine. The orbits varied in the proportion of height and width, one being in each division of the group. Two of the palato-alveolar arches were dolichuranic, one was mesuranic. Two specimens had a right epipteric bone; two had small Wormian bones in the lambdoidal suture, and in one of these a minute sutural bone was at the anterior end of the sagittal suture.

*Ross and Sutherland.* TABLE XIV. PLATE IV.

An adult male skull was obtained from each of these counties; that from Ross was metopic, and the alveolar border of the lower jaw was, to a large extent, absorbed; that



TABLE XIV.—*Highlands and Islands.*

	ARGYLLSHIRE.			PERTH-SHIRE.	SUTHERLANDSHIRE.	ROSS-SHIRE.	HEBRIDES.						
	Loch Tarbert, Kintyre.	Lamahinden.	Loch Tarbert, Kintyre.	Killecrankie.			Iona.				South Uist.	Stornoway.	
						Metopic.				Metopic.			
Collection, . . . .	H.T. 26	H.T. 5	H.T. 25	E.U.A.M.	E.U.A.M.	E.U.A.M.	H.T. 48	H.T. 49	H.T. 50	H.T. 53	H.T. 51	E.U.A.M.	
Age, . . . . .	Ad.	Ad.	Ad.	Adv.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	60	
Sex, . . . . .	M.	M.	F.	M.	M.	M.	M.	M.	M.	M.	F.	68	
Cubic capacity, . . .	1570	...	1435	...	1510	1415	...	1410	1390	...	1380	1260	
Glabello-occipital length, .	196	189	190	198	192	191	189	179	181	186	183	181	
Basi-bregmatic height, .	135	131	132	...	133	139	132	135	135	...	122	121	
Vertical Index, . . .	68.9	69.3	69.5	...	69.3	72.8	69.8	75.5	74.6	...	66.7	66.9	
Minimum frontal diameter, . . .	102	96	95	108	97	96	100	95	96	100	96	93	
Stephanic " " . . .	105	107	101	108	116	117	105	118	104	107	102	121	
Asterionic diameter, " .	107	109	107	110	108	114	113	105	115	103	112	103	
Greatest parieto-squamous breadth, . . .	138s.	132p.	136s.	138s.	144p.	139s.	142s.	142s.	143s.	138s.	141p.	136s.	
Cephalic Index, . . .	70.4	69.8	71.6	69.7	75.0	72.8	75.1	79.3	79.0	74.2	77.0	75.1	
Horizontal circumference, .	542	518	522	533	532	521	...	...	518	524	515	508	
Frontal longitudinal arc, .	130	136	130	...	142	128	135	127	123	124	122	120	
Parietal " " . . .	138	127	133	...	125	131	128	128	128	122	130	120	
Occipital " " . . .	122	104	124	...	118	113	114	110	114	...	120	116	
Total " " . . .	390	367	387	...	385	372	377	365	365	...	372	356	
Vertical transverse arc, .	307	297	300	305	305	300	310	307	307	...	...	282	
Basal transverse diameter, .	123	...	121	132	120	119	121	124	127	...	...	122	
Vertical transverse circumference, . .	430	...	421	437	425	419	411	431	434	...	...	404	
Length of foramen magnum, . . . .	35	36	35	...	37	36	35	35	39	...	38	35	
Basi-nasal length, . . .	104	104	97	...	102	104	101	99	99	...	90	100	
Basi-alveolar length, . .	99	103	96	...	98	97	...	...	...	...	...	100	
Gnathic Index, . . .	95.2	99.	99.0	...	96.1	93.3	...	...	...	...	...	100	
Total longitudinal circumference, . . .	529	...	519	...	524	512	513	499	503	...	500	491	
Interzygomatic breadth, .	134	135	...	...	128	130	...	...	...	...	...	132	
Intermalar " " . . .	119	118	115	...	112	112	...	...	...	...	...	119	
Nasio-mental length, . .	...	113	...	...	121	119	...	...	...	...	...	109	
Complete Facial Index, . .	...	83.7	...	...	94.5	91.5	...	...	...	...	...	82.5	
Nasio-alveolar length, . .	72	63	70	...	71	76	...	...	...	...	...	64	
Maxillo-facial Index, . .	53.7	46.6	...	...	55.4	58.4	...	...	...	...	...	48.5	
Nasal height, . . . .	53	50	49	...	50	55	...	...	...	...	...	49	
Nasal width, . . . .	23	22	26	...	22	22	...	...	...	...	...	24	
Nasal Index, . . . .	43.4	44.	53.1	...	44.	40.	...	...	...	...	...	49.	
Orbital width, . . . .	40	38	38	...	38	39	...	...	...	...	...	41	
Orbital height, . . . .	33	34	32	...	35	32	...	...	...	...	...	30	
Orbital Index, . . . .	82.5	89.5	84.2	...	92.1	82.	...	...	...	...	...	73.2	
Palato-alveolar length, . .	57	55	52	...	59	56	...	...	...	...	...	57	
Palato-alveolar breadth, .	62	60	59	...	64	...	...	...	...	...	...	60	
Palato-alveolar Index, . .	108.7	109.	113.4	...	108.4	...	...	...	...	...	...	105.2	
Lower jaw. {	Symphysial height, . . .	29	...	...	35	36	...	...	...	...	...	30	
	Coronoid " " . . .	68	...	...	60	77	...	...	...	...	...	66	
	Condylod " " . . .	66	...	...	64	76	...	...	...	...	...	70	
	Gonio-symphysial length, . . .	91	...	...	94	92	...	...	...	...	...	93	
	Inter-gonial width, . . .	99	...	...	102	102	...	...	...	...	...	101	
Breadth of ascending ramus, . .	33	...	...	...	32	39	...	...	...	...	...	39	



from Sutherland had the teeth much more complete, but the cranial sutures were in process of obliteration.

In the *norma verticalis* each skull had an elongated ovoid outline, though one was proportionately wider than the other, and the cephalic indices were respectively 75 and 72·8, dolichocephalic; the sagittal line was ridged, and the side walls were bulging, but the Sutherland specimen had, as is unusual in the male skull, the greatest breadth in the parietal region. In the Sutherland cranium the height was materially less than the breadth, but in that from Ross these dimensions were equal. In both, the occipital squama bulged backwards, especially in the Ross specimen. In both, the interzygomatic diameter was less than the greatest breadth of the cranium; they were cryptozygous. In both, the glabella and supraorbital ridges moderately projected, and the forehead had a slight backward slope. In the Ross cranium, a slight vertical transverse depression, as if from a constricting band in infancy, was behind the coronal suture. In both, the occipital longitudinal arc was the shortest; in one, the frontal arc exceeded the parietal; in the other, the opposite condition was met with.

The nasion was moderately depressed, the bridge of the nose was prominent, the anterior nares were narrow, the maxillo-nasal spine, especially in the Sutherland cranium, was projecting; the nasal index was leptorhine. The upper jaw in both was orthognathous. The face was elongated and relatively narrow (leptoprosopic), both in the complete facial and maxillo-facial indices. In one, the orbital index was microseme, in the other megaseme. In the Sutherland specimen the palato-alveolar index was dolichuranic. The cranial capacity was 1415 and 1510 cub. cent. respectively.

The Ross cranium had small Wormian bones in the lambdoidal suture, also one in the left half of the coronal suture, and a very narrow parieto-sphenoid articulation. The cranial bones generally were thin and translucent. The Sutherland cranium was free from sutural or other ossific variations.

#### *Hebrides.* TABLE XIV.

In April 1833, Mr DONALD GREGORY presented to the Phrenological Society of Edinburgh\* six skulls as those of "Druids from the Hebrides" (Henderson Trust collection, Nos. 48-53). In commenting on these specimens, Sir DANIEL WILSON† states that one was brought from Harris, and that the others were no doubt obtained during excavations carried on by the Iona Club in the island of Iona, in the ancient cemetery called "Relig Oran." Iona, he says, is sometimes called the isle of Druids, and the designation affixed by Mr GREGORY to these crania only signified that he believed them to have belonged to the native population prior to the landing of St Columba and the introduction of Christianity in the sixth century. It is to be regretted that in each skull the cranium only has been preserved, and in No. 52 it has been so much injured

\* *Phrenological Journal*, vol. ix. p. 86, 1836.

† *Prehistoric Annals of Scotland*, first edition, p. 173, 1851.



as to make it impossible to obtain measurements which can be relied on. From the condition of the sutures, the skulls were obviously in the later stage of adult life. The sex characters were not strongly pronounced, but it is probable that the majority were of the male sex; one skull was metopic.

*Norma verticalis*.—In their general form, owing to their well-marked parietal eminences, and the mode in which the skull inclined backwards to the occipital squama, the crania had a pentagonal outline. They varied, however, in the proportion of length to breadth, and two were more elongated than the rest. The vertex was not flattened, and, though not ridged, it had a tendency to be elevated in the line of the sagittal suture. The descent from the obelion to the lambdoidal suture was gradual, and the postero-parietal region was obliquely flattened. The mean length of the crania was 183.6 mm., the mean height was 131 mm., the mean breadth was 141 mm., the mean horizontal circumference was 519 mm., the mean vertical transverse circumference was 425 mm., the mean longitudinal circumference was 503 mm. The cephalic index ranged from 74.2 to 79.3; three crania were either dolichocephalic or approximated thereto, whilst two approached the brachycephalic standard; the mean index of the series was 76.9, mesaticephalic. In each cranium the basi-bregmatic height was less than the greatest breadth.

The glabella and supraorbital ridges were moderate in projection, the forehead was slightly retreating, the frontal eminences were distinct. One cranium had a single Wormian ossicle in the lambdoidal suture, and another had a small one near the posterior end of the sagittal suture. No facial measurements could be taken.

I have recently received two female skulls, one a native of South Uist with the teeth in good condition, another born in Stornoway with the teeth all shed and the alveoli absorbed. The crania were elongated and ovoid, of the dolichocephalic type. One, with the index 75.1, fractionally exceeded the upper term of that group; the other had a long slope backwards and downwards in the post-parietal regions, associated with a strong development of Wormian bones in the lambdoidal suture, which gave to that region something of the shelf-like character referred to in the description of the skull from New Lanark (p. 572). In both, the breadth exceeded the height. The facial proportions in the skull from South Uist were mesognathous, chamæprosopic, mesorhine, microseme, dolichuranic. In the Stornoway skull only the nasal and orbital indices could be taken, which were respectively leptorhine and megaseme; the orbit had the unusual relation of being higher than wide; in this skull also each squamous-temporal articulated at the pterion with the frontal bone.

#### *Practical Rooms.* TABLE XV.

Sixteen skulls were obtained from the dissecting-room. The names of ten persons were known, and three of these, Haggart, Howison, and Gordon, were executed for murder from sixty to seventy years ago. The remaining six, though the names were



TABLE XV.—*Crania from Practical Rooms, etc.*

	Haggart.	Howison.	Hart.	Turnbull.	Miller.	Smith.	D.R. A.	D.R. B.	D.R. E.	D.R. C.	Gordon.	D.R. D.	D.R. E.	Wilson.	Jamieson.	Wyllie.	
	Edinburgh University Anatomical Museum.										Ht. 317	E.U.A.M.					
Collection, . . . . .	Ad.	Ad.	23	49	36	60	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	69	58	70	
Age, . . . . .	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	F.	F.	
Sex, . . . . .	1530	...	...	1245	1650	1480	1350	1450	1510	1450	1395	1350	1510	1470	...	...	
Cubic capacity, . . . . .	186	188	196	181	190	191	184	188	187	182	175	188	188	196	184	187	
Glabello-occipital length, . . . . .	136	137	140	136	142	132	127	133	143	137	139	125	120	130	127	135	
Basi-bregmatic height, . . . . .	73.1	72.9	71.4	75.1	74.7	69.1	69.	70.7	76.5	75.3	79.4	66.5	63.8	66.3	69.	72.2	
Vertical Index, . . . . .	92	92	104	92	103	95	96	94	98	94	96	93	99	96	97	90	
Minimum frontal diameter, . . . . .	117	125	124	115	132	121	121	124	119	104	...	113	121	112	112	114	
Stephanic, . . . . .	117	113	116	110	115	117	109	107	109	101	105	115	112	111	109	109	
Asterionic diameter, . . . . .	139s.	147s.	139s.	137s.	142s.	143s.	144s.	139s.	143	141s.	140s.	145s.	147s.	146s.	140s.	138s.	
Greatest parieto-squamous breadth, . . . . .	74.7	78.2	70.9	75.7	74.7	74.9	78.3	73.9	76.5	77.5	80.0	77.1	78.2	74.5	76.1	73.8	
Cephalic Index, . . . . .	520	534	542	512	545	540	525	530	532	515	502	528	533	542	515	527	
Horizontal circumference, . . . . .	138	143	140	125	144	130	126	137	128	130	134	134	126	133	128	127	
Frontal longitudinal arc, . . . . .	134	251	144	134	132	121	123	128	132	123	127	122	126	115	118	140	
Parietal, . . . . .	110	111	113	124	122	113	123	123	112	102	102	122	109	120	116	116	
Occipital, . . . . .	382	394	395	372	400	373	362	388	383	365	363	378	361	368	362	383	
Total, . . . . .	314	329	318	305	322	291	294	308	320	313	304	300	295	300	294	302	
Vertical transverse arc, . . . . .	116	123	126	121	127	131	130	117	...	119	...	126	131	131	...	117	
Basal transversediameter, . . . . .	430	452	444	426	449	422	424	425	...	432	...	426	426	431	...	419	
Vertical transverse circumference, . . . . .	38	37	39	32	37	37	36	33	37	36	29	29	39	39	38	38	
Length of foramen magnum, . . . . .	98	100	106	102	101	104	101	96	105	100	104	98	103	107	94	98	
Basi-nasal length, . . . . .	92	88	102	...	98	109	99	89	102	83	102	93	101	...	...	96	
Basi-alveolar length, . . . . .	93.9	88.	96.2	...	97.	96.2	98.	92.7	97.1	83.	98.1	94.9	98.1	...	...	98.	
Gnathic Index, . . . . .	518	531	540	506	538	514	499	517	525	501	496	505	503	514	494	519	
Total longitudinal circumference, . . . . .	122	140	135	125	132	142	137	130	135	128	...	128	131	144	124	120	
Interzygomatic breadth, . . . . .	105	119	125	111	115	124	121	120	116	114	101	111	118	...	107	104	
Internal, . . . . .	118	...	...	...	...	132	125	...	...	121	...	...	104	...	...	...	
Nasio-mental length, . . . . .	96.7	...	...	...	...	93.	91.2	...	...	94.5	...	...	79.3	...	...	...	
Complete facial Index, . . . . .	65	67	69	70	72	80	73	72	75	70	65	68	61	...	...	68	
Nasio-alveolar length, . . . . .	53.3	48.	51.1	56.	54.5	56.3	53.2	55.3	55.5	54.7	...	53.1	46.5	...	...	56.6	
Maxillo facial Index, . . . . .	50	51	46	51	52	59	53	54	53	51	47	48	50	...	50	50	
Nasal height, . . . . .	20	23	23	23	24	25	24	24	26	22	24	21	27	...	21	20	
Nasal width, . . . . .	40.	45.1	50.	45.1	46.	42.4	45.3	44.4	49.1	43.1	51.1	43.8	54.	...	42.	40.	
Nasal Index, . . . . .	35	42	46	39	38	39	39	39	39	40	37	39	40	40	40	40	
Orbital width, . . . . .	30	34	40	32	34	41	35	32	35	33	31	34	31	35	38	34	
Orbital height, . . . . .	85.7	81.	87.	82.	89.5	105.1	89.7	82.	89.7	82.5	83.8	87.2	77.5	87.5	95.	85.	
Orbital Index, . . . . .	51	50	57	...	57	62	55	49	57	46	54	54	54	...	...	55	
Palato-alveolar length, . . . . .	57	...	62	56	60	...	67	60	68	57	55	63	66	...	...	60	
Palato-alveolar breadth, . . . . .	111.	...	108.	...	105.	...	121.	122.	119.	100.8	101.8	116.6	122.2	...	...	109.	
Palato-alveolar Index, . . . . .	30	33	34	...	...	35	37	...	...	32	...	...	26	...	31	...	
Lower jaw.	Symphysial height, . . . . .	59	60	70	...	74	63	...	...	62	...	...	59	...	55	...	
	Coronoid, . . . . .	61	65	65	...	75	68	...	...	63	...	...	58	...	55	...	
	Condylod, . . . . .	90	...	...	...	93	93	...	...	83	...	...	85	...	85	...	
	Gonio-symphysial length, . . . . .	98	...	...	...	99	108	...	...	96	...	...	98	...	95	...	
	Inter-gonial width, . . . . .	33	31	42	...	36	37	...	...	27	...	...	31	...	33	...	
Breadth of ascending ramus, . . . . .																	



unknown, were, it is believed, natives of Scotland, but I have no information of the part of the country in which they were born.

Fourteen were males and two females. They were all adults, and for the most part in the prime of life; but in some specimens the sutures of the vault were in process of obliteration, the alveolar arches were partially absorbed, and the teeth, when present, were flattened on the crowns from use.

When viewed in the *norma verticalis*, six of the crania were seen to be well filled, but the others could not be regarded as examples of this form of skull, for three were ridged in the sagittal region, and in these, as in several others, there was a marked slope from the sagittal suture to the parietal eminences. Several of the crania had an elongated ovoid outline and were dolichocephalic in proportions; others again were more broadly ovoid, and were from their proportions in the higher terms of the mesaticephalic series; in one specimen the cranium was brachycephalic. Only one skull was metopic, with a stephanic diameter of 130 mm., and its cephalic index was 74·7. The basi-bregmatic diameter exceeded the greatest breadth in only one specimen; in two they were equal, and in five the breadth was not more than 5 mm. in excess of the height. The glabella and supraorbital ridges were well marked, and in three crania unusually so. The frontal bone sloped somewhat backward. The occipital squama projected behind the inion, though in general not to any extent. The downward slope of the more posterior half of the parietal bone was not as a rule steep. The greatest breadth of the crania was in the squamous region. In all the specimens the frontal longitudinal arc exceeded the occipital. In ten the frontal arc exceeded the parietal, in one they were equal, and in the remainder the parietal exceeded the frontal. In two specimens the occipital arc exceeded the parietal, in one they were equal; in the remainder the parietal exceeded the occipital. The stephanic diameter exceeded the asterionic with two exceptions, in one of which these diameters were equal, and in another the asterionic was slightly greater. The interzygomatic breadth in each case was less than the parieto-squamous.

The bridge of the nose, as a rule, projected forwards, and the nasion was not much depressed. The nose had the elongated narrow leptorhine proportions, with four exceptions, in one of which the index was platyrrhine. In six skulls the orbital index was microseme, in five it was megaseme, in the remainder mesoseme.

The palato-alveolar index varied from a hyperdolichuronic, 101·8, to a hyperbrachyuranic index, 122·2. In all the specimens the upper jaw was orthognathous, with two exceptions, in which the index was 98·1, a fraction above the orthognathic term.

With two exceptions the face was leptoprosopic. The mean cubic capacity of the crania of fourteen men was 1449 c.c.

As a rule the skulls rested behind on the conceptacula. No specimen had a third occipital condyl, or a para-mastoid process, though the jugal process was occasionally tuberculated. In two crania indications of an infraorbital suture could be recognised. One skull had a pair of epipteric bones, another had one on the right side, a third had



one on the left; as a rule the parieto-sphenoid articulation was broad. Eight crania had small Wormian bones in the lambdoidal suture.

*Variations in Ossification.*

The skulls examined were regarded as 117 males and 59 females. In considering the variations in ossification the sutures naturally call for special attention. In a number of crania the sutures were in process of ossification, and in a smaller proportion they were, owing to age, to a considerable extent obliterated. No specimen showed characters which indicated that a premature closure of the sutures had taken place. In twenty-three crania, sixteen males and seven females, the frontal suture was distinct, and the metopic condition was present in 13 per cent. of the series. It furnished an example of the persistence during adult life of the foetal division of the bone into right and left lateral halves.

The skull from Dunbar (p. 557) showed on the left side an intraparietal suture which divided the parietal bone into an upper and a lower segment. It is probable that in many, if not in every skull, the parietal bone ossifies from two centres, an upper and a lower, and the presence of this suture is a persistent condition of the plane of separation between these centres.

The infraorbital suture persisted in a number of the crania; but an example of a division of a malar bone into two parts by a suture was not noticed.

A number of examples of sutural bones was recognised. As usual, the lambdoidal suture was their most frequent seat, and no fewer than forty-nine crania had Wormian bones in this suture: in two specimens they were set obliquely so as to form a shelf, which projected the occipital squama backwards, and gave increased length to the cranium. In two skulls an intraparietal bone was present in the parieto-occipital region.

The pterion is a part of the cranium to which anthropologists have given much attention. The series showed every variety from a broad sphenoido-parietal suture to one so pointed that the ali-sphenoid barely touched the parietal angle. The frontal articulated in four crania with the right squamous-temporal, in two with the left, and in one skull the temporo-frontal articulation was present on both sides. In ten crania an epipteric bone was present in the right pterion, in seven in the left, and in eight on both sides. One skull had a sutural bone in the squamous suture. In two crania a small sutural bone occupied the region of the anterior fontanelle, and three others had separate ossifications further back in the sagittal suture. Two crania had each a small bone in the left half of the coronal suture.

In no skull was the occipital bone seen to possess a third or middle condyl. Three had small par-occipital processes, and in several the under surface of the jugal process was tuberculated. In one skull the spine of the sphenoid articulated with the external pterygoid plate of the same bone, and enclosed a pterygo-spinous foramen; and an



approximation to this condition, though without actual junction of the plates of bone, occurred in two other specimens, owing to ossification of the pterygo-spinous ligament.

Five crania showed a vertical transverse depression parallel to and immediately behind the coronal suture, a condition which is usually regarded as due to a tight band or ribbon having been worn across this part of the head in infancy and early childhood. Attention was especially drawn to this character by the late PAUL BROCA, who recognised it as a common occurrence in the heads of the people of France living in and near Toulouse, where the practice of wearing such a band prevails, and to this appearance the name *la déformation toulousaine* has been applied.

In my Report on Human Crania in the *Challenger Reports*, part xxix., 1884, to which I have several times referred in this memoir, I have summarised the observations made on the variations in ossification noted in 143 crania of aboriginal people therein described, *e.g.* from South Africa, South America, Australia and the islands of the Pacific. When compared with the series of Scottish skulls several interesting points of difference may be noted. The absence of the metopic condition of the frontal was remarked in the aboriginal series, although I have since seen it in the skull of a Veddah and in an Andaman islander, and FLOWER has observed metopism in six Andaman crania. The squamous-temporal articulated with the frontal in ten of the aboriginal skulls, which is a distinctly larger proportion than the seven cases I have noted in the Scottish crania. The observations of RANKE and VIRCHOW on German skulls, of CALORI on Italian, and of WENZEL GRUBER on Slavonic crania, give something less than 2 per cent. of cases of temporo-frontal articulation, which is not so high as in the Scottish skulls. On the other hand, the aboriginal series had epipteric bones in sixteen crania, *i.e.* 11 per cent., whilst in the Scottish skulls they were present in twenty-five specimens, about 14 per cent., which is a larger proportion. No third occipital condyl was seen in a Scottish skull, whilst four aboriginal crania had this character. Only one Scottish skull had a pterygo-spinous foramen, which was noticed in three aboriginal crania. Exostoses in the external auditory meatus, so common in the Pacific Islanders, had no representative in the Scottish skulls. Wormian bones in the lambdoidal suture were not uncommon in both series, but the presence of sutural bones in the coronal and sagittal sutures was perhaps somewhat more frequent in the Scottish crania.

It would seem, therefore, that whilst some forms of variation in cranial ossification are more frequent in aboriginal crania, others again are more numerous in a civilised people like the natives of Scotland.

#### GENERAL SURVEY OF THE CHARACTERS OF SCOTTISH SKULLS.

In the preceding sections the characters of the skulls obtained in the several Scottish counties have been described in some detail. In this chapter it is intended to look at them as a whole, with the view of elucidating the form, dimensions, and proportions which prevailed in the crania generally. I have endeavoured to group them according



to sex; and though in the great majority I have succeeded in distinguishing the skulls of the men from those of the women, it is not unlikely that, like other craniologists, I have had to deal with a few specimens in which the sex characters were wanting in precision, and consequently a skull may possibly have been ascribed to the wrong sex. If we grant that this has occurred in a small minority, yet from the numerous specimens at my disposal, in which the sex could confidently be stated, the general conclusions cannot have been materially affected.

I propose, in the first instance, to analyse the dimensions, proportions, and form of the cranial box, and afterwards to consider those of the face.

### *The Cranial Box.*

The shape of the cranium, from its influence on the form of the head and from its association with the brain contained in its cavity, has attracted attention from the earliest periods of craniological research. Since the time of ANDERS RETZIUS the relations of the length to the breadth and the grouping of skulls into those in which the cranium is relatively narrow and elongated, and those in which it is more rounded in form, have been regarded as of great importance in the recognition of racial distinctions. According to modern methods the character of the cranium can be determined by combining observations on its shape with exact measurements. The measurements are taken with callipers in straight lines between certain definite points, in order to determine the length, breadth, and height of the exterior of the box; with a graduated tape over the curved walls of the outer table so as to determine its arcs and circumferences, and with shot to estimate its internal capacity. The points of measurement in the straight lines are indicated by the terms employed in the Tables. The measurements of the curved surfaces, whilst agreeing with the methods pursued in my memoirs in the *Challenger Reports*\* and in my two memoirs on Indian crania† in regard to the horizontal circumference, the vertical transverse arc, and the frontal, parietal, occipital, and total longitudinal arcs, have in this memoir been somewhat amplified so as to yield a vertical transverse circumference and a total longitudinal circumference, dimensions which for the first time are definitely stated in my Tables. The vertical transverse circumference is obtained by measuring with callipers a basal transverse diameter between opposite supra-auricular points, and adding this to the vertical transverse arc. The data for obtaining a total longitudinal circumference existed in the Tables in my previous memoirs, and consisted of the total longitudinal arc, the antero-posterior diameter of the foramen magnum, and the basi-nasal diameter; in this memoir the respective measurements have been added together and stated collectively in the Tables. The capacity of the cranial cavity has been taken by the method described in my *Challenger Report*, 1884, and the additional experience of its

\* *Zoology*, part xxix., 1884, and part xlvii., 1886.

† *Trans. Roy. Soc. Edin.*, part i., 1899; part ii., 1901.



accuracy which I have had since that date has added to my confidence in the method as giving a close approximation to the real capacity, and not an exaggerated statement of the cubage, such as is obtained by the well-known method of PAUL BROCA.

Speaking generally, and subject of course to occasional exceptions, we may say that the Scottish cranium is large and capacious; the vertex is seldom keeled or roof-like, but has a low rounded arch in the vertical transverse plane at and behind the bregma, and with a gentle slope from the sagittal suture to the parietal eminences. The side walls are not vertical, and bulge slightly outwards in the parieto-squamous region, so that the greatest breadth is usually at or near the squamous suture. The occipital squama bulges behind the inion, and the slope from the obelion is downwards and backwards, so as to give in the *norma verticalis* an obliquely flattened character to the postparietal region, but without occasioning a vertical parieto-occipital flattening such as is found in many normal brachycephalic crania, or in those in which artificial compression is employed in infancy. Owing to the width in the parieto-squamous region and the projecting occipital squama (probole) in many crania, their outline is more or less pentagonal, the frontal region forming one boundary, the sides of the cranium as far back as the parietal eminences forming two others, and the remaining two sides are the walls from the parietal eminences to the most projecting part of the occiput. In men the glabella and supraorbital ridges are fairly but not strongly pronounced, the forehead only slightly recedes from the vertical plane, and the nasion is scarcely depressed.

*Length.*—The glabello-occipital or maximum length was measured in one hundred and seventy-six crania, viz., one hundred and seventeen men and fifty-nine women. In the men the longest skull was 204 mm., and eight were 200 mm. and upwards; thirty-three were from 190 to 199 mm., so that nearly one-fourth of these crania were above 190 mm. in greatest length. The shortest skull in the men was 167 mm., and only sixteen crania were below 180 mm. in their greatest length. The longest skull in the women was 193 mm., and only three crania were 190 mm. and upwards; the shortest woman's skull was 161 mm.; and eight crania were below 170 mm. The mean length of the male crania was 186.6 mm., that of the female crania was 178.7 mm.

The projection of the glabella was not, even when most prominent, equal to what one sees in the long skulls of so many Australian and other black people, and consequently the length of the Scottish skull indicated a cranial cavity and a brain longer than existed in the dolichocephalic black races. Owing, however, to the depth of the frontal sinuses and the thickness of the frontal and occipital bones the cranial length from the glabella to the occipital point is appreciably greater, especially in the male sex, than the long diameter of the cerebrum. In order to eliminate the frontal sinus with the consequent projection of the glabella from the comparison, and to associate the length of the skull more closely with the length of the cranial cavity and the cerebrum, it was suggested by Dr ROLLESTON\* that the point to be selected in front for taking the cranial length should be the ophryon, a point immediately above

\* In Greenwell's *British Barrows*, p. 506, 1877, and in vol. i. *Scientific Papers and Addresses*, edited by W. Turner.



the glabella. The observations of A. LOGAN TURNER\* have shown that the frontal sinus is not limited to the region of the glabella and supraorbital ridges, but extends in a large proportion of skulls above the ophryon, so that the influence of the sinus in adding to the cranial length is by no means eliminated by selecting the ophryo-occipital in preference to the glabello-occipital diameter. (Figs. 25, 26, Pl. V.)

*Breadth.*—The greatest parieto-squamous breadth was obtained in one hundred and seventy-four crania, viz., one hundred and fourteen men and sixty women. In the men the broadest skull was 159 mm., and twenty-four crania were between 150 and 159 mm. The narrowest male skull was 130 mm., and twenty-six skulls ranged from 130 to 139 mm. In the women the broadest skull was 153 mm., two specimens being of that diameter. The narrowest skull was 128 mm., and thirty-six specimens ranged from 130 to 139 mm., whilst nineteen were between 140 and 150 mm. The mean breadth of the male crania was 149·3 mm., that of the female was 138 mm. This diameter approximates to the greatest breadth of the cerebrum in each individual.

In addition to the parieto-squamous breadth the tables contain two breadth measurements of the frontal region, as well as the asterionic diameter which gives the breadth of the occipital bone between its lateral angles. As a general rule the frontal stephanic diameter materially exceeded the minimum frontal, though in a few instances it was not more than from 2 to 8 mm. greater. These dimensions give an approximation to the width of the frontal lobes of the cerebrum. Twenty-three crania had a persistent frontal suture, viz. sixteen males and seven females. The metopic crania as a rule exceeded in their frontal diameter the skulls of the corresponding sex from the same locality in which the frontal suture was ossified, and confirmed the view entertained by many craniologists that persistence of the frontal suture contributes to an increase in the transverse diameter of the skull and brain in that region.

The asterionic diameter, except in one skull, was greater than the minimum frontal, but as a rule it was less than the stephanic, though there were several exceptions. This diameter may be regarded as giving an indication of the breadth of the cerebellum.

*Cephalic Index.*—As is well known, this index expresses the relation which the greatest parieto-squamous breadth of a skull bears to its maximum length, the length being regarded as = 100, and the formula is as follows:

$$\frac{\text{greatest breadth} \times 100}{\text{maximum length}}.$$

The index was obtained in one hundred and seventy-four skulls, one hundred and fourteen of which were males and sixty were females. The index showed a great range of variation from 87·2 to 68·2. The mean length-breadth index in the men was 77·4, in the women 77·2. Both sexes, taken collectively, had essentially the same mean index, and were in the middle of the mesaticephalic group. If we follow the customary arbitrary grouping of crania according to the length-breadth or cephalic index, we find

\* *Accessory Sinuses of the Nose*, p. 105. Edin., 1901.



that forty-nine skulls were below 75, *i.e.* dolichocephalic; ninety skulls were between 75 and 79.9, *i.e.* mesaticephalic (mesocephalic); thirty-five skulls were 80 or upwards, *i.e.* brachycephalic

Although it is a matter of convenience to accept a mesaticephalic group, interposed between the more extreme dolichocephalic and brachycephalic forms, it should be kept in mind, as I have stated in my memoir on Indian craniology,\* that if we take 77.5 as marking a division of this group into two sections, the skulls which have an index between 77.5 and 80 approach in their characters more closely to the brachycephalic, whilst those that range from 77.5 to 75, on the other hand, are more allied to the dolichocephalic type. In these crania forty-five mesaticephali had their indices from 77.5 to 79.9, in no fewer than eighteen of which the index was between 79 and 80, brachycephalic therefore in form, though they were fractionally below its lowest numerical limit.

It is obvious, therefore, that a strong brachycephalic strain pervades the population of Scotland at the present time, as in no fewer than fifty-three crania of this series the index was 79 or upwards, either numerically brachycephalic or closely approximating thereto. If expressed in percentages we may say that 20% were numerically brachycephalic, and an additional 10% had a cephalic index from 79 to 79.9; on the other hand, 28% were dolichocephalic, and in 42% the index ranged from 75 to 79.

The relative proportion of the more rounded to the more elongated heads varied, however, materially in the different counties. Of the sixteen skulls from Fife six had the index above 80, one of which was hyperbrachycephalic, two were 79.7, three were between 77.5 and 79. In the Lothians, including Edinburgh and Leith, of seventy-nine skulls twenty had the length-breadth index 80 and upwards, and of these four were hyperbrachycephalic; eight crania also ranged from 79 to 79.9 and were thus essentially brachycephalic, whilst fourteen ranged from 77.5 to 78.9. In the group of nine skulls from Stirlingshire, Lanarkshire, Peebles, and Roxburghshire, two had a length-breadth index above 80, and one of these was hyperbrachycephalic, and three others were 78 or 78.1. The Renfrewshire group of twenty-one crania, on the other hand, had no specimen with an index as high as 80, though three were between 79 and 80, and three were from 77.5 to 79. The three skulls from Ayrshire had one brachycephalic example. Of the six skulls from the north-eastern counties of Forfar, Kincardine, and Banff, four had the length-breadth index 80 or upwards, and one of these was hyperbrachycephalic; the remaining two were 79.7 and 79.9 respectively, and were essentially brachycephalic. In the five crania from Shetland, one was hyperbrachycephalic, and another had the index 79.4. Of the five crania from Iona the two highest were 79 and 79.3 respectively. In the miscellaneous series of sixteen crania from the dissecting-room, only one had an index 80, no specimen was between 79 and 80, and four were from 77.5 to 79.

Our attention should now be directed to the distribution of dolichocephalic crania in the different counties; and along with those whose index is below 75, we shall

\* *Trans. Roy. Soc. Edin.*, vol. xxxix. p. 744, 1899.



consider the crania in the mesaticephalic group with an index between 75 and 77·4. In the Fifeshire group only three had the length-breadth index below 75, and two were 75·5 and 76 respectively. Of seventy-nine skulls from the Lothians twenty were below 75, and two of these were hyperdolichocephalic, while sixteen ranged from 75 to 77·4. Two crania from Lanark were below 75, and one of these was hyperdolichocephalic; two from Roxburgh were 76·2 and 76·3 respectively. In the Renfrewshire group eight skulls were dolichocephalic, and seven were between 75 and 76·7. Two of the three Ayrshire skulls were 75 and 75·9 respectively. Two of the four Wigtonshire were dolichocephalic, the other two were 75·8 and 76·5 respectively. No skull from Shetland was below 75, but three were from 75·1 to 77·4. In three crania from Caithness and six from the Highland counties of Argyll, Perth, Ross and Sutherland, the length-breadth index was in no instance above 75, and two of these were hyperdolichocephalic. Five of the seven crania from the Hebrides ranged from 74·2 to 77. Seven of the dissecting-room series were below 75, and four ranged from 75·7 to 77·1.

From this analysis of the cephalic indices in the crania under observation it would appear that a brachycephalic type of skull prevailed in Fife, in the Lothians, in the north-east counties of Forfar, Kincardine and Banff; and it occurred to some extent in Shetland, in Ayr, in the border county of Peebles, and in Stirlingshire.

The dolichocephalic type of skull was feebly represented in Fife; it was proportionately more numerous in the Lothians, in which district are included the skulls from Edinburgh and Leith; it was represented in Lanark, Ayr, Shetland and the Hebrides. It formed the prevailing type in Wigtonshire, in Caithness, in the skulls from the Highland counties, and in the important series of skulls from Renfrewshire. Whilst examples of this type occurred generally throughout the series, it may be noted that only five hyper-dolichocephali, *i.e.* skulls with the index below 70, were measured, but that eight hyper-brachycephalic crania, *i.e.* with the index 85 and upwards, occurred in the series.

In the study of the Scottish brachycephalic crania I have been led to compare them with crania of some other races measured by me some years ago, which had numerically this type of head. The comparison has been made with twenty-four male Burmese skulls\* and with eight skulls of male Sandwich Islanders† described in previous memoirs, in each of which the cephalic index was 80 or upwards. The mean length-breadth index in the Burmese brachycephali was 84·2. The shortest skull in this group was 158 mm., the longest was 184, and the mean length was 171·8 mm. The parieto-squamous breadth ranged from 139 to 153 mm., and the mean breadth was 144·7 mm. In the Sandwich Islands brachycephali the mean length-breadth index was 83·8; the length ranged from 169 to 184 mm., and the mean was 176·5 mm.; the breadth ranged from 142 to 155 mm., and the mean was 148 mm. In twenty-seven male brachycephalic Scottish skulls the mean length-breadth index was 83·2, almost the

\* See my memoir on Indian Crania, part i., *Trans. Roy. Soc. Edin.*, vol. xxxix., 1899.

† See *Challenger Reports*, "Zoology," part xxix., 1884, pp. 64 and 66, and part xlvii., 1886, p. 125.



same as that of the Burmese. The length ranged from 167 to 193 mm., and the mean was 180·3 mm.; the breadth ranged from 140 to 159 mm., and the mean was 150 mm. The mean length of the Scottish brachycephalic crania exceeded, therefore, by several millimetres the length of the brachycephalic Burmese and Sandwich Islanders. The greater length in the Scottish brachycephali was associated with a backward projection of the occipital squama, which contrasted with the almost vertical post-parieto-occipital region in the Burmese, Siamese and brachycephalic Sandwich Islanders. For the production of a high index in skulls of this type, the breadth required to be proportionately increased, and the Scottish brachycephalic crania both in length and breadth were larger and more capacious than the brachycephalic Burmese and Sandwich Islanders.

*Height.*—The distance from the basion to the bregma was taken as expressing the height of the cranium, and it was measured in one hundred and fifty specimens, ninety-eight of which were males and fifty-two females. In the men the highest skull was 145 mm.; fifteen skulls were between 140 and 145, fifty between 130 and 140, and thirty-four below 130, the lowest being only 117 mm. in height. The mean height of the male skulls was 132·4 mm. In the women the highest skull was 140 mm., the lowest was 118 mm., and the mean was 126. If we compare the height of the male Scottish crania with that of the male Burmese already referred to, we find that the mean height in the latter people was 135 mm., a somewhat greater figure than in the Scottish specimens.

*Vertical Index.*—This index expresses the relation which the basi-bregmatic height bears to the maximum length, which is regarded as = 100, and is computed by the formula

$$\frac{\text{basi-bregmatic height} \times 100}{\text{maximum length}}.$$

The index was obtained in one hundred and fifty crania, ninety-eight of which were men and fifty-two women. It was subject to a great range of variation, from 63·7 to 79·4. The mean vertical index in the men was 70·9, in the women 70·5; both were metriocephalic,\* and the sexual difference was very slight, though slightly in favour of the men. The number of skulls with vertical index 75 and upwards was seventeen; thus a small proportion only were hypsicephalic or high skulls; sixty-five crania on the other hand had the vertical index below 70, *i.e.*, were low skulls, chamæcephalic or tapeinocephalic; the remainder had the index between 70 and 75 and were metriocephalic, which, as above stated, was the mean of the entire series.

*Breadth-Height Index.*—The relations of the length to the breadth and to the height of the cranium have long been recognised as important subjects of investigation

\* I prefer, for the reasons stated in my *Challenger Report*, 1884, to employ the descriptive term metriocephalic rather than orthocephalic, as recommended by the German craniologists in the Frankfurt agreement (*Archiv für Anthropologie*, Bd. xv. p. 1, 1884). In this memoir I have, however, adopted the numerical subdivision of the group which they have suggested, *viz.*, chamæcephalic up to 70, metriocephalic (orthocephalic) 70·1–75; hypsicephalic, 75·1 and upwards.



in the study of the racial characters of skulls, but the relations of the breadth and height to each other have not had an equal attention given to them.

In my *Challenger Report* (1884) I pointed out that in the brachycephalic crania from New Guinea and other Pacific Islands, the breadth was as a rule greater than the height, whilst in the dolichocephalic Papuans the opposite condition prevailed. In subsequent memoirs, more especially those on Indian craniology, I called attention to the relations of these diameters in several Asiatic races. In his work on the accessory sinuses of the nose already quoted, A. LOGAN TURNER has recorded the proportion of breadth to height in a large number of crania, European and exotic.

In order to express numerically the relations of the breadth and height of the cranium to each other, an index may be computed by the following formula :

$$\frac{\text{basi-bregmatic height} \times 100}{\text{parieto-squamous breadth}},$$

the breadth being regarded as 100. The data for obtaining the index exists in the Tables.

When the index exceeds 100, the height is greater than the breadth, and the skull is *hypsistenocephalic*,\* i.e. a high narrow skull : when the index is less than 100, the breadth is greater than the height and the skull is *platychamæcephalic*, i.e. a wide low skull.

From the measurements which I have made of the breadth and height of the cranium in many races of men, I have ascertained that in some the height usually exceeded the breadth, whilst in others the breadth exceeded the height.† In well-pronounced dolichocephalic races like the Esquimaux, the Melanesians, the Dravidians, Veddahs and the Australians generally, as a rule the height was greater than the breadth, and the crania were hypsistenocephalic. In the brachycephalic crania of the Burmese, Siamese, Chinese, Andaman Islanders, and brown Polynesians, on the other hand, the breadth as a rule was greater than the height and the crania were platychamæcephalic.

In the series of one hundred and fifty Scottish crania in which both the breadth and height were measured, in only two skulls was the height greater than the breadth, and in four others they were equal. In all the rest, whether the cephalic index was high or low, the vertical diameter was less than the breadth. A striking feature of the Scottish crania, therefore, was the preponderance of the cephalic index over the vertical index, notwithstanding the considerable number of dolichocephalic skulls in the series, and in this respect the crania favoured the brachycephalic rather than the dolichocephalic type. The Scottish skulls are platychamæcephalic.

*Horizontal Circumference.*—This measurement was taken in one hundred and sixty-three skulls, one hundred and eight of which were males and fifty-five females.

\* Dr Barnard Davis introduced the term hypsistenocephalic to designate the high, narrow dolichocephalic crania of natives of islands in the Western Pacific (*Natuurkundige Verhandelingen*, Deel. xxiv., Haarlem, 1866), and I propose that it should have a more general application, as in the text. The term platychamæcephalic is now suggested to designate wide and low crania.

† See my memoir in *Challenger Report*, 1884 ; also on New Guinea Skulls in *Proc. Roy. Soc. Edinburgh*, July 1899, and on Indian Crania in *Trans. Roy. Soc. Edinburgh*, 1899 and 1901.



The maximum male skull was 572 mm., the minimum was 490 mm., and the mean was 531 mm. The maximum female skull was 550 mm., the minimum was 470 mm., and the mean was 506 mm.

*Vertical Transverse Circumference.*—This measurement was made in one hundred and fifty-three skulls, of which one hundred and three were males and fifty were females. The maximum male skull was 464 mm., the minimum was 398 mm., and the mean was 434 mm. The maximum female skull was 459 mm., the minimum was 381 mm., and the mean was 409.6 mm.

*Total Longitudinal Circumference.*—This dimension was taken in one hundred and thirty-nine crania, of which ninety-six were males and forty-three were females. The maximum male skull was 559 mm., the minimum was 468 mm., and the mean was 513.2 mm. The maximum female skull was 537 mm., the minimum was 441 mm., and the mean was 488.8 mm. The high longitudinal circumference was found in those skulls in which the glabello-occipital length was 200 mm. or approaching thereto, whilst in the skulls in which this diameter was small the longitudinal circumference was relatively low.

The total longitudinal arc was much the most important factor in this measurement, and the skulls were sufficiently numerous to enable me to ascertain the relative lengths of the frontal, parietal and occipital arcs, which collectively form the total longitudinal arc. In the series of skulls in which the arcs were measured, it was found that the occipital arc in thirteen specimens was greater than the frontal and in one hundred and thirty-one it was less: in twenty-six it was greater than the parietal and in one hundred and twelve it was less. It is the rule, therefore, for the frontal and parietal longitudinal arcs to exceed the occipital, though exceptions to the rule occur in recognisable numbers. The relative arcs of the frontal and parietal bones were measured in one hundred and fifty-eight crania; in ninety-six the frontal arc was longer than the parietal, in fifty-five the parietal was longer than the frontal, and in seven they were equal. It is obvious, therefore, that as so much variation occurs in the relative length of the longitudinal arcs, they have no appreciable value as race characters in the Scottish skulls, and the variation occurred in both the brachycephalic and dolichocephalic types. The longest occipital arc was 139 mm., the shortest 94 mm.; the longest frontal arc was 148 mm., the shortest 111 mm.; the longest parietal arc was 148 mm., the shortest 102 mm.\*

From a comparison of the three circumferential measurements it will be seen that the horizontal circumference is the greatest, for it includes both the glabello-occipital and parieto-squamous diameters, which are the longest diameters in the Scottish crania. The vertical transverse circumference, again, is the shortest, as the basi-bregmatic diameter is the shortest of the three dimensions in the Scottish crania. The total longitudinal circumference ranks intermediate, for it includes only one of the two longer diameters.

*Cubic Capacity.*—The internal capacity of the cranium was taken with shot in

\* For the relations of the longitudinal arc to the base line of the cranium, see p. 610.



accordance with the method which I described in 1884.\* One hundred and fifteen crania were cubed; seventy-three were males and forty-two were females. The maximum capacity in the male skulls was 1855 c.c., the minimum was 1230 c.c., and the mean was 1478 c.c. Thirty-three skulls were more than 1500 c.c., and of these seven were 1700 and upwards, nine were between 1600 and 1700, seventeen were between 1500 and 1600; further, twenty-two were between 1400 and 1500, sixteen were between 1300 and 1400, and four were below 1300 c.c. The maximum capacity in the female was 1625 c.c., the minimum was 1100, and the mean was 1322 c.c. Only three female skulls were above 1500 c.c., eight were between 1400 and 1500, sixteen were between 1300 and 1400, eighteen were below 1300, and of these six were below 1200 c.c. The general result approximates to what has been observed in the crania of other races and peoples, that the female skull is about 10 per cent. less capacious than the male. If I had employed BROCA's method, by which the cubic contents of so many races have been taken by anthropologists in France and elsewhere, the average for both sexes would have been considerably higher. It is possible, however, from the Tables compiled by E. SCHMIDT,† to state the cubic contents of the Scottish crania approximately in the terms of BROCA's method, according to which the mean capacity of the males would have been about 1570 c.c. and that of the females about 1400 c.c. The Scottish male skull therefore is, according to BROCA's method of cubage, somewhat in excess of the mean 1500 c.c. ascribed to the crania of European men.

In twenty-five dolichocephalic crania the mean capacity was 1516 c.c., and in twenty-one crania approximating to the dolichocephali in which the cephalic index was from 75 to 77·4 the mean capacity was 1519 c.c. In thirteen brachycephalic skulls the mean capacity was 1469 c.c., and in fifteen, in which the cephalic index ranged from 77·5 to 79·9, the mean capacity was 1452 c.c. A claim has been made by people whose crania have brachycephalic proportions that a brachycephalic head is higher in its type than a dolichocephalic. So far as the quality of type is expressed by the amount of cranial capacity, the skulls of the people of Scotland do not sustain this claim, as those with dolichocephalic proportions had a distinctly greater mean capacity than the brachycephali.

In addition to these more general statements, the Tables enable us to form some estimate of the existence of differences in the capacity of skulls from various districts of Scotland, though in many localities the number measured was too small on which to generalise. In the male skulls from Fife, Mid-Lothian, Shetland and Renfrewshire, the average in each group was, according to my measurements, somewhat more than 1500 c.c.; in East Lothian and Wigtonshire it was slightly lower than 1500; in the skulls from Edinburgh and Leith, West Lothian, the North-Eastern Counties, the Highland Counties and the Dissecting-room, the mean again was still lower. In making this statement I do not draw any inference that the difference in cranial capacity had a

\* *Challenger Reports*, "Zoology," part xxix., 1884.

† *Archiv für Anthropologie*, supplement, vol. xiii. p. 53, 1882.



definite relation to the intellectual endowment of the people in these localities. Many other factors than the volume of the cranial cavity have to be taken into consideration in the estimation of the intellectual power either of individuals or of a collection of individuals belonging to the same people or race.

In the comparison of different races with each other there is, however, evidence that those in which the mean cranial capacity is low are intellectually inferior to the races whose mean capacity is on a distinctly higher scale.

If we take as an example the aboriginal Australians who are recognised as a race incapable, apparently, of intellectual improvement beyond their present condition, my measurements have shown that in thirty-nine men the mean cranial capacity was 1280 c.c., whilst twenty-four women were only 1156 c.c. Of the men, eight had a smaller capacity than 1200 c.c., and four only were above 1400 c.c.; whilst in the women ten were below 1100, and only three were 1200 c.c. and upwards.

The differences between the capacities of the native Australians and the Scottish skulls are much more than can be accounted for by variations in the stature and muscularity of the two peoples, and undoubtedly express a size and quality of brain associated with differences in the intelligence and the mental capabilities of the two races.

### *The Face.*

All craniologists from the time of PRICHARD and RETZIUS have agreed in stating that in the study of the face it is important to determine the degree of forward projection of the upper jaw and to decide if the face is orthognathic or prognathic.

*Gnathic Index.*—In this memoir I have adopted the method followed by Sir Wm. H. FLOWER and compared the length from basion to nasion with that from basion to the alveolar point. The basi-nasal length was taken in one hundred and forty-nine skulls, and ranged in the males from 91 mm. to 110 mm., and the mean was 101·4 mm.; whilst in the females it ranged from 86 to 105, with a mean of 95·3 mm. The basi-alveolar length ranged in sixty-seven males from 81 mm. to 108 mm., and the mean was 96 mm.; whilst in thirty-one females it ranged from 79 to 102, with a mean of 91 mm.

The gnathic index was computed as follows :

$$\frac{\text{basi-alveolar length} \times 100}{\text{basi-nasal length}}.$$

Whilst the index gives the numerical relation between the two diameters, it does not necessarily express the relative projection of the upper jaw beyond the profile outline of the face, for in many skulls the nasion is depressed below the plane of the glabella and of the forehead generally.

The gnathic index was computed in ninety-seven skulls, sixty-six of which were men and thirty-one women. It ranged from 85·1 to 103·2, and the mean in the men was 94·5, in the women 94·8. If we take FLOWER's subdivision of the group, and regard an index 103 as marking the lowest limit of prognathism, only one specimen came into that



category. If an index 98 be taken as marking the upper limit of orthognathism, seventy-two skulls belonged to this group, whilst twenty-four had indices from 98 to 103 and were mesognathous. The Scottish skulls are therefore characterised by an almost complete absence of prognathism.

It is sometimes stated that in the same race or people the women show a relatively greater prognathic character than the men. This can scarcely be said of the Scottish skulls, for the difference between the two sexes was only fractional, so that for all practical purposes they may be regarded as identical.

*Orbital Index.*—BROCA paid much attention to the determination of the height and width of the orbit and to the computation of an index of their relative proportions. The width was measured from the dacryon, or point of junction of the frontal, lachrymal and ascending process of the maxilla, to the most distant point on the edge of the outer border of the orbit. These measurements were taken in one hundred and twenty-four skulls. The greatest width in eighty-four males was 46 mm., the least was 35 mm., and the mean was 39 mm.; in forty females the greatest width was 41 mm., the least was 35, and the mean was 37·4 mm. The greatest height in the males was 41 mm., the least was 28 mm., and the mean was 34 mm.; in the females the greatest height was 37 mm., the least was 29 mm., and the mean was 33 mm.

The orbital index is obtained as follows :

$$\frac{\text{orbital height} \times 100}{\text{orbital width}}.$$

The index was computed in one hundred and twenty-five skulls, of which eighty-four were men and forty-one were women. It ranged from 73·7 to 105·1, and the mean was 86·4.

In grouping skulls in their orbital and nasal indices I have in this, as in my previous craniological memoirs, adopted the terms employed by BROCA and FLOWER, as well as their numerical divisions of the groups. An orbit is said to be microseme when the height is low in relation to the width and the index is below 84. Thirty-three skulls came into this group. On the other hand, when the height and width closely approximate so that the base is rounded and the index is 89 and upwards, the orbit is megaseme, and to this group fifty-seven specimens belonged, and in three of these the index was 100 or upwards. Orbits are named mesoseme when the index is between 84 and 89, and thirty-three skulls fell into this category. In Scottish skulls the rule was for the orbit to be high in relation to the width, and somewhat rounded in outline, though exceptions not unfrequently occurred. My observations on the orbital index in the skulls of numerous races have satisfied me that it presents a great range of variation in the same race, and that it possesses only a secondary value as a race character.

*Nasal Index.*—The relation between the height of the nose, measured from the nasion to the lower border of the apertura pyriformis, and the greatest width of that aperture, constitutes one of the most important anthropological characters of the face.



In eighty-four male skulls the height ranged from 60 mm. to 46 mm., and the mean was 53.5 mm. ; in thirty-eight females the range was from 57 mm. to 44 mm., and the mean was 49.9 mm. In eighty-two males the nasal width ranged from 28 mm. to 19 mm., and the mean was 23.1 mm. In thirty-five females the range was from 26 mm. to 19 mm. with a mean of 22.1 mm. The nasal index expresses the numerical relation between the width and height, and is computed as follows, the height being = 100 :

$$\frac{\text{nasal width} \times 100}{\text{nasal height}}$$

The index was obtained in one hundred and twenty-three specimens, eighty-one males and forty-two females. It ranged from 55.3 to 34.5 ; the mean was 42.5, and with few exceptions the height was more than twice the width. If with BROCA and FLOWER we regard all skulls in which the nasal index is 53 and upwards as platyrrhine, *i.e.* with the pyriform aperture wide in relation to the height of the nose, only four specimens exhibited this character. On the other hand, in ninety-three skulls the anterior nares were narrow and elongated, and the nasal index below 48 was leptorrhine, and in fourteen of these specimens the index was below 40. The remaining twenty-six skulls had the index ranging from 48 to 53 and formed an intermediate or mesorrhine group. The occurrence of wide nostrils in the Scottish face may be regarded therefore as accidental, and due perhaps to intermixture, through an ancestor, of a strain of some race in which a platyrrhine nose was an ethnic character. The four platyrrhine specimens were one in each of the East Lothian, Mid-Lothian, Highland and Dissecting-room groups. The customary form of nose in Scotland is long, relatively narrow, with a well-marked bridge, and projecting so that the type of face is prosopic, which means that the nose distinctly projects beyond a line drawn between the anterior part of the two malar bones.

*Facial Indices.*—An important character which has been systematically studied by KOLLMANN is the relation between the length and breadth of the face in different crania. The length or height of the entire face is measured from the nasion to the lower border of the symphysis menti, whilst the breadth is between the most projecting parts of the two zygomata. In twenty-one male skulls measured, the longest face was 137 mm., the shortest was 104 mm., and the mean was 120.7 mm. ; in six females, the mean length was 108.8. In sixty-eight male skulls the greatest breadth was 144 mm., the least was 117 mm., and the mean was 132.2 mm. In thirty female skulls the greatest breadth was 135 mm., the least was 115 mm., and the mean was 121.5 mm. With one exception, in which the length and breadth were equal, the breadth of the face exceeded the length.

A complete or nasio-mental facial index can be computed as follows :

$$\frac{\text{nasio-mental length} \times 100}{\text{interzygomatic breadth}}$$

As so frequently happens in craniological collections, the lower jaw had been preserved in only a small number of the skulls, and the complete facial index could only be



taken in twenty-six specimens, twenty-one males and five females; the mean of the series was 90: that of the males was 92·3, that of the females 87·8.

KOLLMANN divides skulls and heads into two groups according to the relation of the length to the breadth of the face. When the index is 90·1 or upwards the face, he says, is leptoprosopic, high (long) or narrow faced; when the index is below 90·1 it is chamæprosopic, low or broad faced. In the study of the proportions of the face, and in grouping skulls in accordance with their facial indices, it is useful, as in the other relative proportions of the skull, to have a group intermediate between the two more extreme forms. We may appropriately speak, therefore, of a third or mesoprosopic group, and include in it those skulls and heads in which the index ranges from 85 to 90, both inclusive. The chamæprosopic group under this arrangement would consequently be limited to those heads in which the index is below 85. In the series of Scottish crania under consideration eighteen were leptoprosopic, four were mesoprosopic, and only four were chamæprosopic in my more limited use of the term.

To obtain as far as possible an idea of the relation between the length and breadth of the face in skulls where the lower jaw is absent, KOLLMANN has suggested that the interzygomatic breadth should be compared with the length of the superior maxilla measured from the nasion to the alveolar point between the two central incisors. Seventy-nine crania were measured in these diameters, viz., fifty-six males and twenty-three females.

The male crania ranged in the maxillary length from 61 mm. to 84, and the mean was 71·6 mm. The female crania ranged from 60 to 74 mm., and the mean was 67 mm. An index, which may be appropriately named *maxillo-facial*, can be computed as follows:

$$\frac{\text{nasio-alveolar length} \times 100}{\text{interzygomatic breadth}}.$$

The maxillo-facial index was taken in seventy-nine skulls, fifty-five of which were males and twenty-four females. It ranged from 61·8 to 46·5, and the mean was 54·6.

In grouping crania under the maxillo-facial index, KOLLMANN employs the same terms, leptoprosopic and chamæprosopic, as in the divisions of the complete facial index, but the numerical limits of the two groups, owing to the length representing only a segment of the complete face, are necessarily different. When the maxillo-facial index is 50·1 and upwards, he regards it as leptoprosopic; when 50 or less, it is chamæprosopic. In this memoir I have retained the numerical limit of the leptoprosopic group, and find that with seven exceptions all the skulls belonged to it, and that in five leptoprosopic specimens the index ranged from 60·3 to 61·8. If a division of the chamæprosopic group of KOLLMANN into mesoprosopic and chamæprosopic were adopted for the maxillo-facial as I have suggested for the complete facial index, and 45 were taken as the lower numerical limit of the mesoprosopic group, the seven exceptional skulls above referred to would fall into that group. No skull, therefore, in its maxillo-facial index was



chamæprosopic in this more restricted use of that term, and the general type of the face in the Scottish crania is leptoprosopic.

The facial indices may be grouped as follows :

	Complete facial. <sup>1</sup>	Maxillo-facial.
Leptoprosopic, . . . . .	90·1 and upwards, . . . . .	50·1 and upwards.
Mesoprosopic, . . . . .	85 to 90, . . . . .	45 to 50.
Chamæprosopic, . . . . .	below 85, . . . . .	below 45.

<sup>1</sup> The complete or nasio-mental facial index corresponds, in the diameters from which the index is computed, with the zygomatic facial index of KOLLMANN. The maxillo-facial index corresponds with the upper facial index of KOLLMANN in the points of measurements.

A low or chamæprosopic maxillo-facial index necessarily depends on the upper jaw being short, in relation to the breadth of the face, and for the production of a chamæprosopic complete facial index in both the upper and lower jaws being relatively short. A relatively short upper jaw necessarily also affects both the height of the nose and the height of the orbit, so that one would expect to find a chamæprosopic face associated with a low and possibly a platyrrhine nose and with a low or microseme orbit. The Scottish face is therefore long and narrow in comparison with the broad, squat faces in the Mongolian and some other types of head. In the Esquimaux, for example, the mean interzygomatic diameter in eighteen males was 138·0 mm., whilst in the Scotsmen it was only 132·2 mm.

*Palato-alveolar or Palato-maxillary Index.*—Anthropologists concur in considering that the relations between the length and breadth of the hard palate in the races of men should be enquired into. BROCA\* and VIRCHOW† limited the measurements in this region to the hard palate itself, and computed an index which has been named staphylin or palatal. FLOWER‡ modified and improved these measurements by including the alveolar arch, and computed an index which he termed maxillary. In my *Challenger Report*§ I suggested that the terms palato-maxillary or palato-alveolar were to be preferred, as expressing more fully the parts measured and the index which is computed from them. The length is taken from the alveolar point to the midpoint of a line drawn between the hinder ends of the alveolar borders, and the width is between the outer part of the alveolar arch opposite the second upper molar tooth. The palato-alveolar length in fifty-five males ranged from 46 to 62 mm., and the mean was 55·6 mm.; in twenty-eight females the range was from 45 to 59 mm., with a mean 51 mm. The palato-alveolar breadth in the males ranged from 50 to 71 mm., and the mean was 60·9; in the females the range was from 52 to 64 mm., with a mean of 58·3 mm.

\* *Instructions craniologiques*, p. 77.

† *Archiv für Anthropologie*, Bd. xv. s. 5, 1884.

‡ "Cranial Characters of Fiji Islanders," *Journ. Anthropol. Inst.*, November 1880.

§ 1884, p. 7, and *Journ. Anat. and Phys.*, vol. xvi. p. 135, October 1881.



The palato-alveolar index was computed as follows :

$$\frac{\text{palato-alveolar breadth} \times 100}{\text{palato-alveolar length}}$$

In my *Challenger Report* I suggested that relatively long palato-alveolar regions with an index below 110 should be named dolichuranic ; relatively wide palates with an index above 115, brachyuranic ; and those with an intermediate index between 110 and 115, mesuranic. As skulls exhibit, however, a wide range in the index in this region, I now make the further suggestion that when the index falls below 105 it should be called hyperdolichuranic ; where it exceeds 120, hyperbrachyuranic. The divisions of the group may be expressed in tabular form as follows :

Hyperdolichuranic,	. . . . .	below 105.
Dolichuranic,	. . . . .	105 to 110.
Mesuranic,	. . . . .	110 to 115.
Brachyuranic,	. . . . .	115 to 120.
Hyperbrachyuranic,	. . . . .	above 120.

In this series of Scottish skulls nineteen were hyperbrachyuranic ; seventeen were brachyuranic ; fifteen were mesuranic ; twenty were dolichuranic ; and eleven were hyperdolichuranic. In only three specimens, two females and a male, was the length greater than the breadth ; but in twenty-eight skulls the length was considerable in relation to the breadth, though not greater, so that the palate had an elongated appearance. As a rule, however, the breadth of the region was materially greater than the length, and the form of the palato-alveolar arch was that of a wide horseshoe.

*Lower Jaw.*—This bone had been preserved in only thirty-five skulls, twenty-six of which were males. In several of these, many teeth had been lost during life and their alveoli absorbed, so that the form of the bone had been more or less modified. Where the teeth had been in great part preserved, the body of the jaw had in the male sex a vertical diameter at the symphysis, ranging from 26 to 37 mm., and with a well-defined chin ; the ascending ramus was broad and the angle was pronounced. The entire jaw had in most specimens a massive appearance, which had materially contributed to give character to the face, and from the marked vertical diameter of the body of the bone had constituted an important factor in giving to the entire face a length which placed it distinctly in the leptoprosopic group. The condyloid and coronoid diameters of the jaws varied in relative length in the series : in seventeen specimens the height from the angle to the top of the condyl was greater than to the tip of the coronoid, whilst in thirteen the coronoid height was longer, and in three specimens they were equal. The intergonial width ranged in the male jaws from 88 to 114 mm., and the mean of twenty-four specimens was 100 mm., a diameter between the angles of the jaw materially below the interzygomatic, intermalar and stephanic breadths, but distinctly higher than the minimum frontal diameter.

To assist the reader in obtaining a bird's-eye view of the dimensions and proportions



of the constituent parts of the Scottish skulls studied in this memoir, I have prepared Table XVI., in which I have stated for both sexes the maximum and minimum dimensions, as well as the mean of the principal measurements in the series of skulls, together with the maximum, minimum and mean of the respective indices. I have also, by way of comparison, included in the Table the mean diameters and indices of a number of skulls of male aboriginal Australians which I have measured.

TABLE XVI.

<i>Scottish Skulls.</i>							<i>Australians.</i>
	Females.			Males.			Males.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean.
Cubic capacity, . . . . .	1625	1100	1322	1855	1230	1478	1280
Glabello-occipital length, . . . .	193	161	178.7	204	167	186.6	191.3
Basi-bregmatic height, . . . . .	140	118	126	145	117	132.4	135
Vertical index, . . . . .	77.6	64	70.5	79.4	63.7	70.9	70.6
Greatest parieto-squamous breadth, .	153	128	138	159	130	149.3	132
Cephalic index, . . . . .	87.9	69.3	77.2	87.2	68.2	77.4	69
Horizontal circumference, . . . . .	550	470	506	572	490	531	530
Vertical transverse circumference, . .	459	381	409.6	464	398	434	...
Basi-nasal length, . . . . .	105	86	95.3	110	91	101.4	...
Basi-alveolar length, . . . . .	102	79	91	108	81	96	...
Gnathic index, . . . . .	100	86.7	94.8	103.2	83	94.5	100.6
Total longitudinal circumference, . .	537	441	488.8	559	468	513.2	...
Interzygomatic breadth, . . . . .	135	115	121.5	144	117	132.2	...
Nasio-mental length, . . . . .	114	102	108.8	137	104	120.7	...
Complete facial index, . . . . .	92.2	82.5	87.8	100	79.3	92.3	...
Nasio-alveolar length, . . . . .	74	60	67	84	61	71.6	...
Maxillo-facial index, . . . . .	61.8	48	55.1	60.8	46.5	54.3	...
Nasal height, . . . . .	57	44	49.9	60	46	53.5	...
Nasal width, . . . . .	26	19	22.1	28	19	23.1	...
Nasal index, . . . . .	54	34.5	44.4	55.3	37.9	38.9	57
Orbital width, . . . . .	41	35	37.4	46	35	39	...
Orbital height, . . . . .	37	29	33	41	28	34	...
Orbital index, . . . . .	102.8	73.7	84.6	105.1	76.9	87.2	81.8
Palato-alveolar length, . . . . .	59	45	51	62	46	55.6	...
Palato-alveolar breadth, . . . . .	64	52	58.3	71	50	60.9	...
Palato-alveolar index, . . . . .	130.6	94.5	109.8	130	98.2	113	109

*Sagittal Sections.*

In my *Challenger Report*, 1884, I gave a figure of at least one characteristic specimen of each group of aboriginal skulls, in which a skull had been bisected longitudinally and vertically immediately to one side of the septum nasi and the mesial plane of the cranial cavity, and in Part II. of the memoir on Indian Crania I produced two figures of a similar kind. In my description of these figures in the *Challenger Report* I stated that I was in accordance with Professors HUXLEY\* and CLELAND† in regard to the import-

\* *Jour. of Anat. and Phys.*, Nov. 1866, vol. i.

† *Ibid.*, July 1877, vol. xi., and Memoir on Variations already cited.



ance of the study of sections of this kind. In my present memoir I have pursued a similar method and have figured in Plate V. a series of sections.

The basion (*b*) has been selected as a centre, and from it radii have been drawn to definite points on the periphery of the skull. The only radius which requires explanation is the perpendicular (*p*), which is named from being drawn from the basion perpendicular to the plane of the foramen magnum. The perpendicular radius reaches the vertex usually more than an inch behind the bregma, and its upper limit approximates to the upper end of the fissure of Rolando, and indicates the posterior boundary of the frontal lobe of the cerebrum. The part of the cavity in relation to the cranial vault which lies in front of the perpendicular radius may be regarded as occupied by the frontal lobe, whilst that which lies behind the same radius and above the plane of the tentorium contains the parietal, occipital and temporo-sphenoidal lobes. The length of the several radii in the five Scottish skulls bisected and measured is given in Table XVII.

TABLE XVII.

Radii and other Lines.	Fife, Mh. C. IX. 83·4.	Mid-Lothian, Rx. C. IX. 80·1	Mid-Lothian, C. C. IX. 77·5.	Northmaven, Shetland. C. IX. 75·1.	Kintyre. C. IX. 70·4.
	mm.	mm.	mm.	mm.	mm.
Basi-occipital, . . . . .	109	104	114	116	112
Basi-lambdal, . . . . .	114	117	120	123	119
Perpendicular, . . . . .	131	136	142	145	135
Basi-bregmatic, . . . . .	130	134	142	141	134
Basi-glabellar, . . . . .	108	105	110	118	114
Basi-nasal, . . . . .	98	99	104	110	104
Basi-alveolar, . . . . .	99	91	91	97	99
From perpendicular radius to anterior pole of cranial cavity, . . . . .	81	82	90	92	94
From perpendicular radius to posterior pole of cranial cavity, . . . . .	77	78	80	86	85
Basi-occipito-sphenoid axis, . . . . .	61	67	66	70	61
Cribriform axis, . . . . .	31	24	30	29	31
Sphenoido-ethmoid angle, . . . . .	137°	144°	136°	147°	137°
Spheno-maxillary line, . . . . .	80	72	75	73	72
Spheno-maxillary angle, . . . . .	91°	85°	76°	88°	92°
Base line, . . . . .	134	133	141	146	139
Total longitudinal arc, . . . . .	365	371	395	407	390

It will be seen that in each skull the distance from the perpendicular radius to the anterior part of the cranial cavity in which the anterior pole of the cerebrum is lodged, is longer than to the corresponding point behind, in which the occipital pole of the cerebrum is situated. The two crania in the table with brachycephalic proportions, Fife Mh. and Mid-Lothian Rx., show a closer approximation in the amount of cerebral space in front of and behind the perpendicular radius than is the case with the three mesaticephalic and dolichocephalic skulls. In the dolichocephalic Fuegian, Admiralty Island and Oahuan skulls measured in my *Challenger Report*, p. 120, the brain space behind the perpendicular radius was greater than that in front, but the contrary was the case in the mesaticephalic and brachycephalic skulls recorded in the same Report.



In addition to the radial lines drawn on the figures, the dimensions of which are given in Table XVII., lines have been drawn to express other relations. Thus the line *s* is parallel with the dorsum sellæ and cuts the plane of the foramen magnum at an obtuse angle,—named in my *Challenger Report* the foramino-sellar angle. The line *o.s.* is drawn from the basion through the basi-occipital, and the body of the sphenoid to the sphenoido-ethmoid articulation. It is the basi-occipito-sphenoid axis, and corresponds with the basi-cranial axis of HUXLEY. The line *c.r.*, or cribriform axis, is in the plane of the cribriform plate of the ethmoid bone, is drawn through the sphenoido-ethmoid and ethmo-frontal sutures, and its length is the distance between these sutures. It is intersected by the basi-cranial axis, and forms with it the sphenoido-ethmoid angle or basi-ethmoid angle of HUXLEY. If the inclination of the basi-occipito-sphenoid axis were a constant quantity, variations in this angle would express the degree of departure of the cribriform plate from the horizontal plane; but as the basi-cranial axis is not of uniform obliquity in the human skull, the angle may be modified by its degree of inclination, as well as by that of the cribriform axis. The difference in the angle in the series of crania was not more than  $8^{\circ}$ .

A line drawn from the sphenoido-ethmoid angle to the most projecting part of the superior maxilla is the speno-maxillary line, and it forms with the basi-occipito-sphenoid axis, the speno-maxillary angle. If this axis had been constant in its obliquity the angle would have been necessarily more open in prognathic jaws, but with this, as with the sphenoido-ethmoid angle, variations in the angle are also produced by modifications in the obliquity of the basi-cranial axis. In determining the value of this angle the obliquity of both the factors, which by their intersection form it, requires to be considered. The maximum difference in this angle in the five crania was  $16^{\circ}$ .

Of the three factors which collectively make up the longitudinal circumference, two, viz., the length of the foramen magnum and the basi-nasal diameter, together form the base line as defined by CLELAND. The total longitudinal arc constitutes the third factor, and the tables of measurements of the respective skulls give the data from which the relation of the base line to that arc in each specimen can be easily computed.

In the five male skulls specified in Table XVII. the relation of the base line to the longitudinal arc was as 1 to 2.78. In a larger series of seventeen male skulls from Fife and Mid-Lothian the relation was as 1 to 2.8. In a series of twenty male Australian aborigines the base line was to the arc as 1 to 2.72, which gives, therefore, a smaller proportion of arc. In the Scottish skulls the mean length of the base line was 134.3 mm. and that of the arc was 376.5, whilst in the dolichocephalic Australians the mean base line was 139.8 mm. and that of the arc was 380.4.

I have measured the arc and base line in the skulls of five adult male gorillas, and found the mean base line to be 163.8 mm. and the mean arc 311.6, the proportion of base line to arc being as 1 to 1.9. The increase in the proportion of the base line to the longitudinal arc in the human skull may be regarded, therefore, as marking a stage of approximation to a lower mammalian type.



*Summary.*

The customary characters of the Scottish skulls may be summarised as follows :—

The crania were generally capacious, with the vertical transverse arc rounded behind the bregma, and they were not vertically flattened in the parieto-occipital region. The mean length-breadth index was mesaticephalic, but many specimens were dolichocephalic, and others brachycephalic. The mean vertical index was metriocephalic, though a considerable proportion were chamæcephalic. The breadth was greater than the height, and the crania were platychamæcephalic. The mean cubic capacity in the males was 1478 c.c., in the females 1322 c.c. The face was usually orthognathous, sometimes mesognathous; the nose was prominent, long and narrow, leptorhine; the orbits had usually the vertical diameter high in relation to the transverse, mesoseme or megoseme; the face was high in relation to the width, leptoprosopic; the palato-alveolar arch varied in the relations of length and breadth, but the form was frequently that of a wide horse-shoe. The lower jaw had a well-defined angle, the body of the bone was massive in the males, and with a pronounced chin.

I have restricted myself in Part I. of this memoir to the consideration of the anatomical characters of Scottish skulls as seen in the people of modern times along with a few which are perhaps mediæval in date. To complete the subject it will be necessary that skulls obtained in prehistoric burials in Scotland should be carefully examined. For this purpose I have collected from time to time, as opportunities occurred, specimens from different parts of Scotland, and have prepared descriptions which I hope to communicate as a second part of the memoir to the Society before the end of the session. In Part II. will also be discussed the characters of Scottish crania and heads in their general ethnographical relations to prehistoric races in Britain, and to the people of the adjoining part of the Continent of Europe.



## EXPLANATION OF PLATES I.-IV.

The crania in these plates were photographed with much care by my friend and former pupil, W. E. Carnegie Dickson, B.Sc., M.B., to whom I was indebted for the series of photographs published in illustration of my "Memoirs on Indian Craniology." The process blocks were prepared from Dr Dickson's negatives by Messrs M. & T. Scott, Craigmillar Park.

- Fig. 1. Profile of male skull, Dunfermline. Table I., H. T. 578.
- Fig. 2. *Norma facialis* of the same skull.
- Fig. 3. Vertex view of same skull.
- Fig. 4. Profile of male skull from inland parish, Fife. Table I., Me.
- Fig. 5. Vertex view of same skull.
- Fig. 6. Profile of male skull from Fife. Table I., Ma.
- Fig. 7. Vertex view of same skull.
- Fig. 8. Profile of male skull, country parish, Mid-Lothian. Table III., Rt.
- Fig. 9. Vertex view of same skull.
- Fig. 10. Facial aspect of female skull from Paisley. Table X.
- Fig. 11. Vertex view of same skull.
- Fig. 12. Profile of male skull, country parish, Renfrewshire. Table IX., W.
- Fig. 13. Profile of male skull, Kirkmadrine, Wigtonshire. Table XI., A.
- Fig. 14. Vertex view of same skull.
- Fig. 15. Vertex view of male skull, St Ninian's, Shetland.
- Fig. 16. Facial view of same skull.
- Fig. 17. Profile view of same skull.
- Fig. 18. Profile of male skull from Sutherlandshire. Table XIV.
- Fig. 19. Facial view of same skull.
- Fig. 20. Vertex view of same skull.

## EXPLANATION OF PLATE V.

Fig. 21. Vertical transverse section through a cranium from Renfrewshire. The section was made through the occipital condyles, mastoid processes, and the vertex about  $1\frac{1}{2}$  inch behind the bregma. The specimen gives a favourable view of the rounded low arch of the vertex when seen in the transverse plane. In this and the other sections I took a careful impression of the cut surface, which was subsequently reduced by photography for the process block.

Figs. 22-26. Antero-posterior almost mesial sections through skulls on which radial lines have been drawn from the basion to points on the periphery of the skull. *b.*, basion; *fm.*, plane of foramen magnum; *b.al.*, basi-alveolar radius; *b.n.*, basi-nasal radius; *b.gl.*, basi-glabellar radius; *b.br.*, basi-bregmatic radius; *b.p.*, perpendicular radius; *b.l.*, basi-lambdal radius; *b.oc.*, basi-occipital radius; *s.m.*, spheno-maxillary line; *cr.*, the cribriform axis, a line parallel to the cribriform plate; *o.s.*, basi-occipito-sphenoid axis; *s.*, plane of dorsum sellæ.

- Fig. 22. Section of male brachycephalic skull from Fife. Table I., Mb. C. IX. 83.4.
- Fig. 23. Section of male brachycephalic skull from Mid-Lothian. Table III., Rx. C. IX. 80.1.
- Fig. 24. Section of male mesaticephalic skull from Mid-Lothian. Table III., C. C. IX. 77.5.
- Fig. 25. Section of male mesaticephalic skull from Northmavine, Shetland. Table XIII. C. IX. 75.1.
- Fig. 26. Section of male dolichocephalic skull from Kintyre. Table XIV., H.T. 26. C. IX. 70.4.



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Shetland Islands . . . . .		582	Orbital Index . . . . .	603
Perthshire . . . . .		584	Nasal Index . . . . .	603
Argyllshire . . . . .		585	Facial Indices . . . . .	604
Ross and Sutherland . . . . .		585	Palato-alveolar Index . . . . .	606
Hebrides . . . . .		587	Lower Jaw . . . . .	607
Practical Rooms . . . . .		588	Sagittal Sections . . . . .	608
Variations in Ossification . . . . .		591	Summary . . . . .	611
			Explanation of Plates . . . . .	612







SIR WILLIAM TURNER ON "Craniaology of the People of Scotland."—PLATE I.



FIG. 1.—Dunfermline.



FIG. 2.—Dunfermline.



FIG. 3.—Dunfermline.



FIG. 4.—Fife.



FIG. 5.—Fife.







SIR WILLIAM TURNER ON "Craniology of the People of Scotland."—PLATE II.



FIG. 6.—Fife.

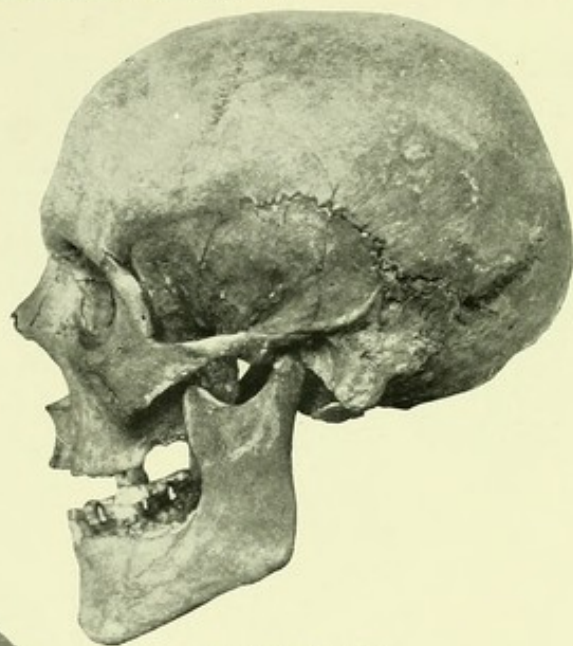


FIG. 8.—Mid-Lothian.

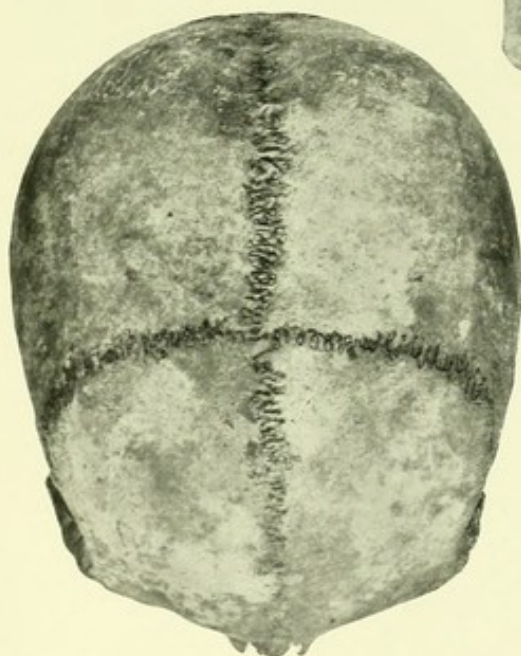


FIG. 7.—Fife.



FIG. 10.—Paisley.

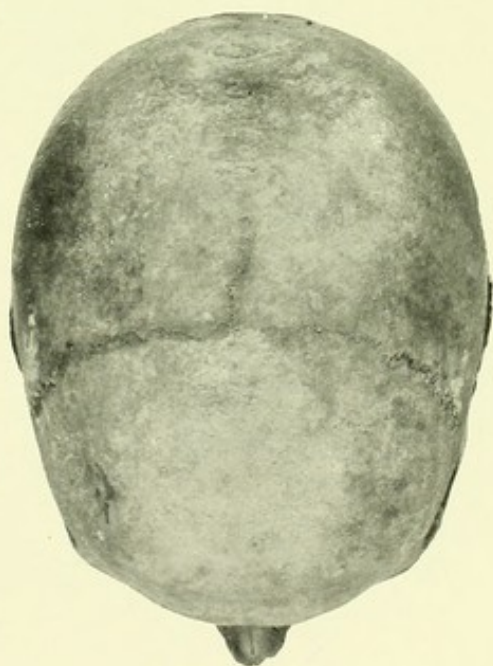


FIG. 9.—Mid-Lothian.







SIR WILLIAM TURNER ON "Craniology of the People of Scotland."—PLATE III.



FIG. 12. —Renfrewshire.



FIG. 13. —Wigtonshire.

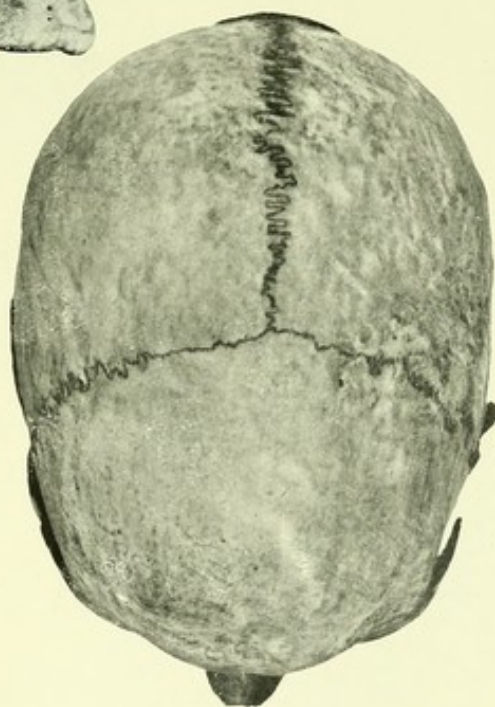


FIG. 14. —Wigtonshire.



FIG. 11. —Paisley.

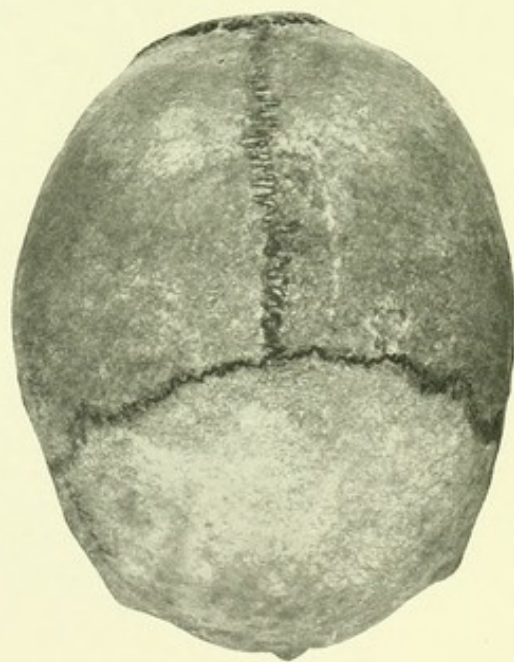


FIG. 15. —Shetland.







SIR WILLIAM TURNER ON "Craniology of the People of Scotland."—PLATE IV.



FIG. 18.—Sutherland.

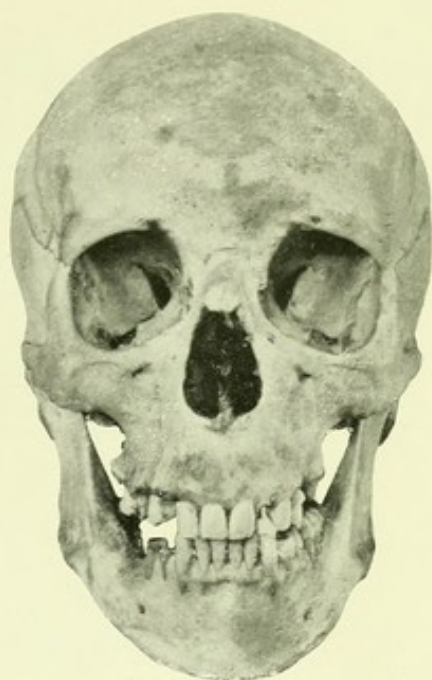


FIG. 19.—Sutherland.

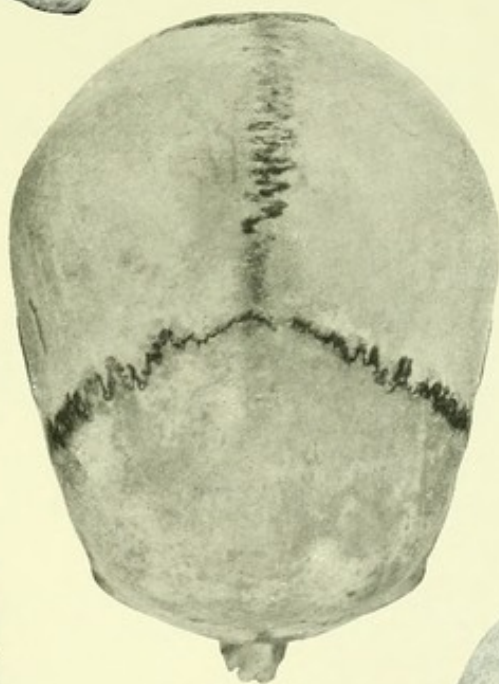


FIG. 20.—Sutherland.



FIG. 16.—Shetland.



FIG. 17.—Shetland.







SIR WILLIAM TURNER ON "Craniology of the People of Scotland."—PLATE V.



FIG. 21.—Renfrewshire.

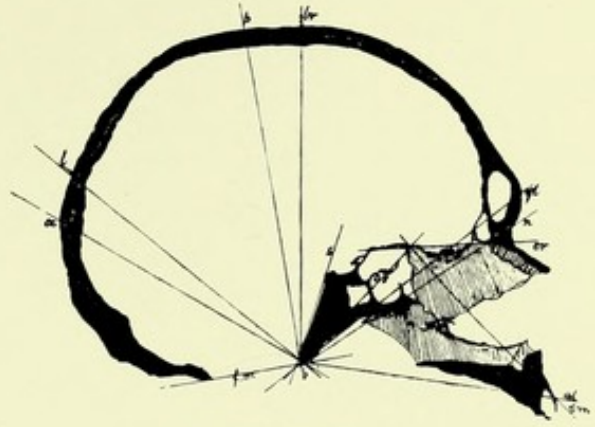


FIG. 22.—Fifeshire.

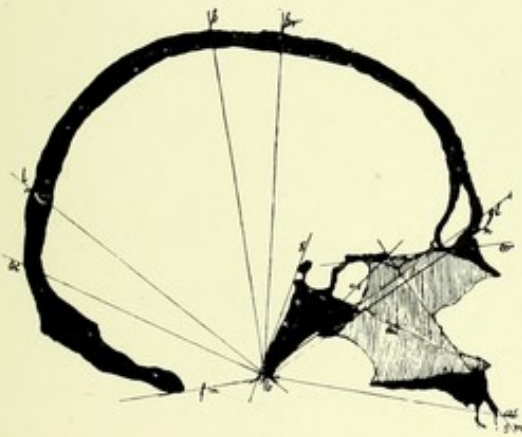


FIG. 23.—Mid-Lothian.

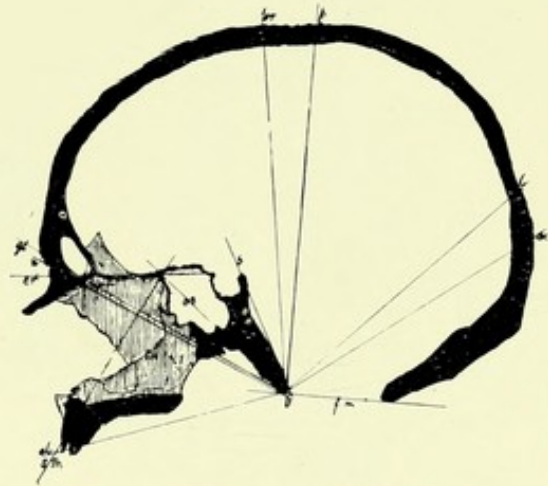


FIG. 24.—Mid-Lothian.

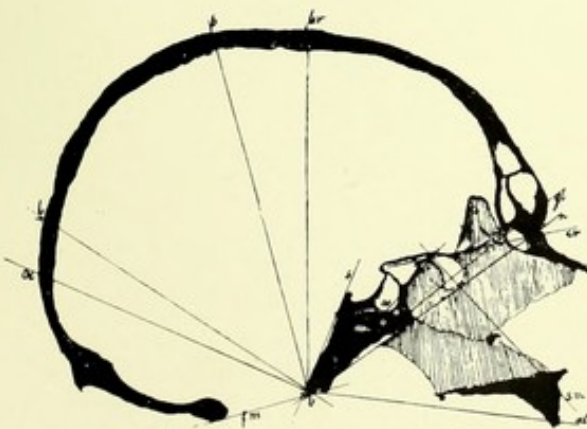


FIG. 25.—Shetland.

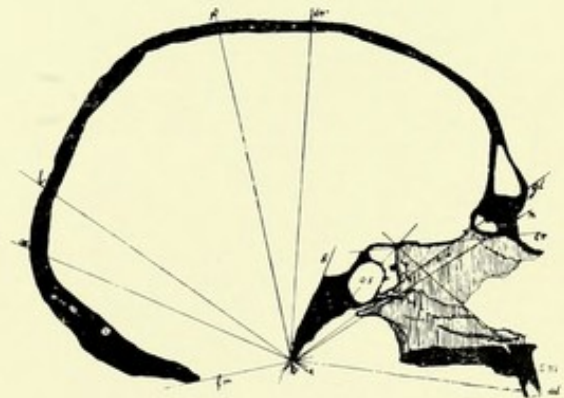


FIG. 26.—Kintyre.



