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possibly have formed weapons for attacking the larger animals when they came down to drink, but the theory that they were used for breaking holes in ice, I think is also a very likely one. If so it would follow that the climate of the north of Ireland when these implements were used was much colder than it is at present. I believe the tanged flakes were used mounted possibly for spearing fish, as suggested by Dr. Evans, when referring to similar implements from Lough Neagh in "*Archæologia*," vol. xli, p. 401. But whatever the use of either kind may have been there is no doubt that they are common implements in the deposit of diatomaceous clay on the banks of the Bann, and uncommon, if found at all, in other parts of the north of Ireland where flint implements are common.

The following communications were also read :—

W. D. GOOCH, Esq., entitled "Notes on the occurrence of Stone Implements in South Russia;" "Jade Implements in Switzerland," by HODDER M. WESTROPP, Esq.; "Notes on the Discovery of Prehistoric Remains in Central Russia," by C. H. E. CARMICHAEL, Esq., M.R.S.L. Extracts from these will appear in a future number of the Journal.

On the CRANIAL CHARACTERS of the NATIVES of the FIJI ISLANDS.

By WILLIAM HENRY FLOWER, LL.D., F.R.S., P.Z.S.,
V.P. Anthropol. Inst., etc.*

THE Viti, or as it is now more commonly called, Fiji Archipelago, consists of two large, and a considerable number (estimated at 250) of small islands, of which about 80 are inhabited. The latter lie mostly to the east of the main islands, and nearer to the Tongan and Samoan groups. The geographical situation of the Archipelago gives it its peculiar ethnological interest, as it is placed close to the line which forms the boundary between the portions of the ocean inhabited mainly by one or other of the two great and very distinct races of the Pacific, the Melanesian and the Polynesian, using the former term for all the dark-skinned, frizzly-haired, dolichocephalic people of the Western Pacific, and the latter for the light-brown, straight-haired, brachycephalic or sub-brachycephalic race, called Malayo-Polynesian by the older writers, and for which Messrs. Keane and Whitmee have lately proposed the name of Sawaiori.

In accordance with this geographical position, as well as from observations based upon their physical characters and social condition, the Fijians have generally been considered to be a mixed or mongrel people, containing elements derived from both

* Read June 22nd, 1880.

of these essentially different races. Thus Hale says: "From the description which has been given of the natives of the Fiji group it is evident that they cannot properly be ranked with either of the two neighbouring races, although they approach nearest to that which inhabits the islands to the west of them. In colour, they are neither yellow nor black, but a medium of the two, a sort of reddish-brown. Their hair is neither woolly nor straight, but long and frizzled. In form and feature they hold the same undecided position, and however it may be in reality, in appearance they cannot be better described than as a mulatto tribe, such as would be produced by a union of Melaneseans and Polynesians."*

It must, however, be noted that this description of the American ethnographer, as well as nearly all our other knowledge of the physical characters of the Fijians, is derived from natives of the smaller islands, or of the eastern coast of the principal island, Viti Levu, who have for a long time maintained an intercourse, sometimes friendly and commercial, and at other times hostile, with the neighbouring Tongan group inhabited by a pure Polynesian race, while hitherto scientific observations upon the inhabitants of the interior of either of what may be called the continental islands of the group, where the primitive characters of the people may be expected to be met with in their greatest purity, have been extremely scanty. This applies with scarcely any reserve to the osteological characters, as (with one exception) all the specimens of crania of the Fiji islanders described up to the present time have been brought from some of the smaller islands.

The precise origin of the one which was for many years the sole representative of the Fijian race in European collections, that presented to the Museum of the Royal College of Surgeons of England by Dr. Hobson, the figure of which in Martin's "Natural History of Quadrupeds, etc." (1840), has been reproduced in several anthropological works, is certainly unknown, but as it was obtained from a man who died in the hospital at Hobart Town, probably one of the crew of a whaling ship, and as its essential characters differ totally from those about to be described, it is tolerably certain that it could not have been from the interior of either of the large islands.

Dr. J. W. Spengel† has described and figured eight crania from the Godeffroy and other Museums in Germany, not one of which is known with any certainty to have been that of a native of

* "United States Exploring Expedition under Wilkes (1838-42)" ('Ethnography and Philology,' by Horatio Hale (1846), p. 174).

† "Beiträge zur Kenntniss der Fidschi-Insulaner" ("Journal des Muséum Godeffroy," Band i, Heft iv, 1873, p. 239).

either of the main islands. The same may be said of the ten specimens in the Barnard Davis collection.*

In the latest exhaustive summary of our knowledge of the cranial characters of the Melanesian people, that given in the "*Crania Ethnica* of De Quatrefages and Hamy" (Livraison vii, p. 288), fifteen skulls are mentioned from the small islands, probably presenting more or less of Polynesian mixture, and one only from the interior of Viti Levu, brought by M. Filhol. This is briefly described, and is said to present in the highest degree the characters of the Papoua (Melanesian) race.

The great interest of the collection now before us lies in the fact that it contains a series of sixteen crania, of both sexes, and various ages, of Kai Colos or natives of the mountainous regions of the interior of the large island of Viti Levu. These were obtained in 1876 by Baron Anatole von Hügel, to whose promised work on the Islands and their inhabitants all geographers and ethnologists are looking forward with great interest.† With these I am able to compare a series of thirteen, seven being those of adults and six of children, from the east coast of Viti Levu, or islands, such as Ovalau, situated near to the coast. These are partly from Baron von Hügel's collection, partly from that of Dr. Barnard Davis, but mainly from a collection made by Mr. Boyd in 1879, and acquired for the Museum through the liberality of Mr. Luther Holden, President of the College. A third series, consisting of seven crania, partly from the Von Hügel and partly from the Barnard Davis collection, is derived from Vanua Balavu, one of the Lau, Eastward or Windward Islands, situated about 150 miles east of Viti Levu, and nearer to the Tongan group.

The skulls of the Kai Colos, or mountaineers of the interior of Viti Levu, being by far the most important series, will be described first. Of these, the greater number, amounting to fourteen, were obtained by Baron von Hügel in August 1876, from a cave formerly used as a burial place by the Ngalimari tribe, at Wakuku, on the Siga Toka river, in the Nandrunga district, which lies towards the south-western end of the island. They form a very representative series, as far as age and sex are concerned. Eleven are perfectly adult. In one (No. 1136, Osteol. Catalogue), all the permanent teeth have been acquired, including the third molars, but the basal suture is not closed. In another, all the permanent teeth are in place except the last

* "*Thesaurus Craniorum*" (1867), p. 314, and Supplement to the same (1875), p. 74.

† Baron von Hügel's entire craniological collection, consisting of thirty seven skulls of natives of various islands of the Western Pacific, was purchased in 1879 by Mr. Erasmus Wilson, F.R.S. and presented by him to the College.

molars; and one is that of a young child with the milk teeth only in place. These three are not included in the measurements from which the averages are derived. Of the adults, several have the appearance of considerable age; in two the whole of the teeth have been lost during life, and the alveolar walls absorbed. In most, the ordinary characters by which the sexes of skulls are distinguished are well marked, but in two there is some ambiguity, but placing these with the sex which on the whole they most resemble, I have classed six as males and five as females.

None of them present any signs of having died other than a peaceful death, or of having been injured in any way afterwards, and this fact, with that of several having considerably outlived the vigour of manhood, as shown by consolidation of sutures and loss of teeth, affords no corroboration of the accounts of the excessive ferocity and cannibalism ascribed to these people.*

The two other skulls of Kai Colos, both adult males, are from Voresika, in the Na Drau district, and bear different evidence of the native character, having both been broken by blows from clubs in a fray with members of a neighbouring tribe.

Neither these nor any other of the Fiji crania bear any certain evidence of having been designedly subjected to any process of artificial deformation, although one (No. 1130) is unsymmetrically distorted in the occipital region, being flattened on the right side.

The crania of the Ngalimari will be first described, as they form a single homogeneous series. Nothing can be more striking than their wonderful similarity in all essential characters; this is even more marked than in the series of crania of the Andamanese, the subjects of a previous memoir.† In size there is some difference, but it would be almost impossible to find any equal number of human skulls presenting so little variation in general conformation, except such as is due to sex and age.

As before mentioned, with two exceptions, the characteristic distinguishing signs of the different sexes are strongly marked, the males being known by their superior size, the comparative thickness and roughness of their walls, and the greatly developed glabella, supra-orbital ridges, supra-mastoid ridges, and mastoid processes.

Taken all together, they may be classed as large skulls, indicating a people probably above the average stature, and of considerable muscular development. In this respect, however,

* It is possible that they may have been victims of the epidemic of measles which committed such havoc among the inhabitants of the island immediately after our annexation in 1874.

† See "Journal of the Anthropological Institute," November, 1879, vol. ix, p. 108.

Fig 1.

Fig 2.

W. H. H. H.

Hanhart imp.

CRANIA OF FIJIAN. 2.

Fig. 2.

Hanhart imp.

Fig. 1.

J. Smith lith.

CRANIA OF FIJIANS. 1

Fig. 1.

Fig. 2.

J. Smit lith.

Hanhart imp.

CRANIA OF FIJIANS. 3

there is a considerable disparity between the sexes. The average horizontal circumference of the six males is 534 millimeters, that of the five females 501. The average vertical transverse circumference of the males is 434, of the females 412 millimeters. The same dimensions of the Andamanese were 480, 462, 410, and 395 millimeters.

The average cranial capacity of the six males is 1504 cubic centimeters, one being as high as 1660. The average capacity of the females is 1327, giving a ratio between the sexes of 100 to 88. This, owing to the insufficiency of the number of the specimens, is only an approximation, but it does not differ greatly from that found in other races.* The general average is very much the same as that of 138 Europeans of various nations,† and considerably above that of any other of the frizzly haired races, except the Kaffirs. It exceeds that of the Australians in the ratio of 100 to 87.

In general form all the crania belong to the most pronounced type of the class called by Dr. Barnard Davis *hypsi-stenocephalic*, characterised by their length, height, and laterally compressed wall-like sides. The *norma occipitalis* (Plate XIV, fig. 2) presents a high pentagon, the sides of which are nearly vertical, the maximum transverse diameter, usually situated near the squamosal suture, being rarely greater, and sometimes even less than the diameter between the supra-mastoid ridges.

The latitudinal or cephalic index is remarkably low, being less than 70 in every one of the series, and in one case (No. 1126) as low as 62·9,‡ calculated on the ophryo-occipital length, or 61·9, if calculated on the glabello-occipital length, the plan so frequently adopted by anthropologists on the continent. This is the lowest index of any normal cranium in the collection, being very slightly below that of a skull of unknown origin, described by Prof. Huxley,§ which so closely resembles in all important characters those now under consideration, that it might easily have been taken for one of the series. The mean latitudinal index of the six males is 65·5, that of the five females 66·5, so that 66 may be taken as representing the entire series, a far lower mean index than has hitherto been found in any race.

* See "Journal of the Anthropological Institute," November, 1879, vol. ix, p. 113.

† "Catalogue of Osteology of Vertebrate Animals. Mus. Roy. Col. Surgeons," Part, i, 1879, p. 254.

‡ In the catalogue the index of this cranium is given as 61·9, the breadth being 120 millimeters. But this is the maximum parietal breadth only. The maximum breadth, taken according to the Paris instructions, which I shall adopt in future, being in this case (alone among the crania of the series) situated on the squamosals and is 122 millimeters, giving the index cited above.

§ "On two widely contrasted Forms of the Human Cranium" ("Journal of Anatomy and Physiology," vol. i, 1867, p. 60).

The Fijian mountaineers, therefore, if this series may be taken as a fair representation of the whole, are the most dolichocephalic, or more properly *stenocephalic*, people in the world.

Are they also to be regarded as remarkable for their height? Following the French school in taking the basio-bregmatic line as the most convenient measurement of altitude, we find an average of 142·7 millimeters for the males, and 137·2 for the females. This very considerably exceeds the maximum breadth in every case, and gives the average ratio of height as compared to breadth as 111 to 100. In the Andamanese, on the other hand, the height always falls short of the breadth. But these relations may depend as much upon variations of the breadth as of the height, and show nothing absolutely about the latter. In the same way the altitudinal index obtained by the usual method of comparing the height with the total length of the cranium is also fallacious, for in long skulls the height must appear less than in short ones. Thus the Andamanese by this test would appear more deserving of the epithet "lofty" than the Fijians, their altitudinal index being 77·9, while that of the latter is only 74·1, but this arises from the very short antero-posterior diameter of the former compared with the latter. A more just comparison may perhaps be made by taking the basio-nasal length as the standard. This being reckoned as 100, the average height in the Fijian is 138, in the Andamanese 136, in 25 English crania 132, in 17 Eskimo 133. More extended comparisons on this basis are desirable, but the subject will be referred to again before the conclusion of the memoir.

The contour of the roof of the cranium as seen in the *norma lateralis* (Plate XII), shows a fairly developed and rounded frontal region, passing into a very regular arched line, the highest point of which is situated rather behind the bregma, and continued into an occipital region prolonged considerably behind the external auditory meatus. Narrowness from side to side is the characteristic of every region of the cranium; even the parietal eminences form but slight projections upon the general evenness of the lateral walls (*see* Pl. XIV, fig. 1). The anterior and upper region of the parietal bones is flattened, giving an angular or roof-shape to the upper part of the skull, and there is generally a very slight diminution of convexity in the region of the obelion; but there are none of those marked and regular depressions on the surface frequently seen in Tasmanian and other Melanesian crania. Generally speaking, the surface of the upper part of the cranium is smooth and even, though in the males the temporal ridges are distinctly visible throughout their course, and the mastoid processes are large and

rough on the surface, and the occipital ridges and inion strong and rugged. In the females the latter only form smooth rounded eminences.

The sutures are rather faintly marked in most of the crania, and generally simple in character. In four of the older skulls, partial consolidation has taken place throughout the principal sutures. One only is metopic, No. 1102, a female, but in common with the other sutures the frontal is nearly obliterated. Wormian bones in the lambdoid suture are absent in four of the crania, and in the others generally few and simple. Union of the squamosal with the frontal by means of a *processus frontalis* occurs in both sides of one cranium, and on one side in another. In all the others, the distance between these bones is very small, in no case exceeding a centimeter. An epipteric bone occurs in one case only.

As might be supposed, every one of the adult skulls is strongly phænozygous.

The well-rounded, and in some cases rather prominent though narrow forehead, ends below in a strongly marked brow-ridge, overhanging the root of the nose and especially the orbits. This is of course more pronounced in the males than the females, but is present in all, including the children, and is one of the most marked characteristics of the skulls. In most of the males the glabella is somewhat sunken between the supra-orbital ridges, and there is a depression above separating it from the forehead, but in Nos. 1128 and 1130, as well as in the females, the contour of the forehead passes almost insensibly into the glabella. The exact amount of the projection of this eminence from the forehead is seen by comparing the ophryo-occipital with the glabello-occipital length (*see* Table of Measurements). In the males it averages 2·6 millimeters, being only 1 millimeter in the two crania just mentioned, but as much as 3 or even 4 in the others, while in the females the difference is scarcely perceptible, averaging but $\frac{2}{10}$ of a millimeter.

The whole face is remarkably short from above downwards, compared with the European, or with the true Polynesian races. This is due to diminution of the height, both of the nasal aperture and of the subnasal portion of the face.

The orbits show a marked contrast in form and character in the two sexes. In the males they are oblong, with greatly thickened margins, with an average index of 84·2. In the females they are more nearly square, with thin and sharply defined edges, having an index of 90·7. In the children their form is more rounded, and in the youngest, an infant with the milk teeth only, the height is actually greater than the width, the index being 103·3. The series thus exemplifies in an extremely

striking, almost exaggerated manner, the usual variations of the orbital form, according to sex and age, which were demonstrated by Broca in his interesting memoir on the orbital index.

The nose is one of the most important of the features as a characteristic of race, and its form is very accurately indicated in its bony framework. There is a striking similarity in this region in the whole series. The aperture is large, being high, owing to the shortness of the nasal bones, and also of great width. The average nasal index of both sexes is 56·6, very much the same as that of the Australians and the African negroes in the Museum. With one exception (No. 1127, the index of which is 50·0) all belong to the platyrrhine group (index above 53). The nasal bones are small, narrow at the upper end and widening below, not flattened as in African negroes, but more or less laterally compressed, and meeting at a rounded angle at the median dorsal ridge. The profile of this ridge is hollowed below the naso-frontal suture (though not so deeply as in the Australian), and then curves rather abruptly forwards, and turns slightly downwards at the tip. A nose formed upon this bony sub-structure would evidently be of considerable size, with broad alæ and open nostrils, would be sharply marked off from the forehead by a groove, and have a prominent bridge, placed high up on the dorsum, as represented in many descriptions and drawings of individuals of the Melanesian race.

The form of the lower margin of the nasal aperture is generally one of the best distinctive characters between the white and the black races of men. All the skulls of this series present the distinguishing form of the latter, *i.e.*, effacement of the sharp, elevated border, and more or less insensible passage from the floor of the nasal chamber to the anterior surface of the alveolar process; part of the floor of the chamber, concealed in the European by the border just mentioned, being visible externally in a front view of the face. Concurrently with this formation of the lower margin of the nostrils, the nasal spine is always feebly developed, usually No. 2 of Broca's scale, or smaller; never equalling No. 3.

The average naso-malar angle is 135·6, ranging between 130° and 139°, about equal, therefore, to that of the English, and showing no Mongolian affinities.*

* I find that for greater precision it is advisable to modify the definition of this angle, given in the paper on the Andamanese (*J. A. Inst.* vol. ix. p. 117.) Instead of "the middle of the outer margin of the orbits," a spot immediately beneath the fronto-malar suture is preferable to rest the limbs of the goniometer upon, the angle being then almost exactly in the horizontal plane of the cranium. The results obtained this way differ somewhat from those previously given. The average in 106 crania of natives of the British Islands is 135·2 I hope shortly to have made a sufficient number of observations to test fully the value of this angle as a race character.

No. in Catalogue.	Sex.	1 Capacity.	2 Length (ophryo-occipital).	2a Length (glabell-occipital).	3 Height (basi-bregmatic).	Transverse diameters of cranium.					9 Index of breadth.	10 Index of height.	Horizontal circumference.		13 Vertical transverse circumference.	Transverse		
						4 Minimum frontal.	5 Maximum frontal.	6 Occipital.	7 Biauricular.	8 Maximum.			11 Preauricular.	12 Total.		14 Frontal.	15 Bregmatic.	
Ngalimari tribe. Nandronga district. Viti Levu.																		
1125	♂	1540	197	201	146	96	107	110	117	129	65·5	74·1	236	532	430	285	295	
1126	♂	1550	194	198	141	95	106	105	112	122	62·9	72·7	235	521	423	286	300	
1127	♂	1530	193	196	143	99	112	110	124	134	69·4	74·1	237	530	435	285	300	
1128	♂	1660	203	204	148	97	116	120	120	134	66·0	72·9	254	546	463	295	310	
1129	♂	1370	194	197	140	97	112	104	113	127	65·5	72·2	244	526	428	292	300	
1130	♂?	1375	190	191	138	98	107	111	111	125	65·8	72·6	236	518	425	293	300	
Average...	♂	1504	195·2	197·8	142·7	97·0	110·0	110·0	116·1	128·1	65·6	73·1	240·3	533·8	434·0	289·3	300·8	
1131	♀?	1350	186	186	140	94	105	108	112	123	66·1	75·3	223	505	420	280	296	
1132	♀	1300	181	182	142	97	108	106	113	126	69·6	78·5	230	502	420	282	290	
1133	♀	1380	185	185	137	93	109	101	114	124	67·0	74·1	233	502	410	280	292	
1134	♀	1355	189	188	136	97	106	103	108	123	65·1	72·0	230	508	410	282	290	
1135	♀	1250	181	182	131	89	102	102	106	117	64·6	72·4	215	488	398	260	275	
Average...	♀	1327	184·4	184·6	137·2	94·0	106·0	104·0	110·6	122·6	66·5	74·4	226·2	501·0	411·6	276·8	288·6	
Na Drau district. Viti Levu.																		
1139	♂	1445	188	190	145	101	115	107	115	128	68·1	77·1	239	518	435	292	305	
1140	♂	1500	191	193	142	93	113	106	114	128	67·0	74·3	236	520	435	298	308	

CRANIAL MEASUREMENTS OF NATIVES OF THE IN

Horizontal circumference.		13 Vertical transverse circumference.	Transverse arcs.				Longitudinal arcs.			Of foramen magnum.		Projections (visual axis being horizontal).				27 Basal-nasal length	28 Basal-alveolar length.	29 Gnathic index.	30 Bizygomatic.
11 Preauricular.	12 Total.		14 Frontal.	15 Bregmatic.	16 Parietal.	17 Occipital.	18 Frontal.	19 Parietal.	20 Occipital.	21 Length.	22 Width.	23 Facial.	24 Anterior cranial.	25 Posterior.	26 Total.				
236	532	430	285	295	318	275	126	145	130	35	28	20	90	103	213	110	110	100·0	144
235	521	423	286	300	315	275	135	146	122	34	27	18	85	103	206	102	105	102·9	134
237	530	435	285	300	320	272	130	133	132	36	29	26	83	105	214	108	109	100·9	140
254	546	463	295	310	330	288	152	142	133	37	27	23	81	117	221	99	104	105·1	139
244	526	428	292	300	300	275	133	144	117	33	28	—	89	100	—	102	—	—	138
236	518	425	293	300	316	275	133	133	132	30	28	—	93	95	—	103	—	—	126
240·3	533·8	434·0	289·3	300·8	316·5	276·6	134·8	143·8	127·7	34·2	27·8	—	86·8	103·8	—	104·0	107·0	102·9	136·
223	505	420	280	296	317	263	130	147	116	34	27	—	84	97	—	99	—	—	125
230	502	420	282	290	304	248	125	136	110	34	25	15	90	86	191	104	105	101·0	127
233	502	410	280	292	306	252	132	142	115	34	28	18	86	94	198	96	103	107·3	123
230	508	410	282	290	312	257	134	141	121	34	27	15	82	96	193	95	98	103·2	124
215	488	398	260	275	292	260	120	135	112	34	24	17	87	92	196	97	105	108·2	121
226·2	501·0	411·6	276·8	288·6	306·2	256·0	128·2	140·2	114·8	34	26·2	—	85·8	93·0	—	98·2	102·7	104·6	124
239	518	435	292	305	310	266	135	135	120	31	28	24	81	100	205	104	106	101·9	133
236	520	435	298	308	315	282	134	143	120	35	27	—	82	105	—	100	—	—	130

S OF NATIVES OF THE INTERIOR OF VITI LEVU.

20 Length of axis being measured.	26 Total.	27 Basal-nasal length.	28 Basal-alveolar length.	29 Gnathic index.	Diameters of face.			33 Height of Face.	34 Height of Malar.	35 Height of Alveolus.	36 Auriculo-orbital length.	Of Orbit.			Of Nasal Aperture.			Of Maxilla.	
					30 Bizygomatic.	31 Bijugal.	32 Inter-orbital.					37 Width.	38 Height.	39 Index.	40 Height.	41 Width.	42 Index.	43 Length.	44 Width.
3	213	110	110	100·0	144	121	28	80	27	17	70	40	34	85·0	46	28	60·9	—	—
3	206	102	105	102·9	134	118	28	80	26	16	69	37	32	86·5	47	25	53·2	—	—
5	214	108	109	100·9	140	123	27	87	25	17	70	42	36	85·7	54	27	50·0	61	67
7	221	99	104	105·1	139	118	23	88	24	16	67	40	33	82·5	52	28	53·5	60	69
0	—	102	—	—	138	119	27	82	26	—	70	39	32	82·0	48	29	60·4	59	67
5	—	103	—	—	126	116	24	—	27	—	67	38	32	84·2	44	26	59·1	—	—
3·8	—	104·0	107·0	102·9	136·8	119·2	26·2	83·4	25·8	—	68·8	39·3	33·2	84·5	48·5	27·1	55·9	—	—
97	—	99	—	—	125	106	23	—	22	—	66	38	34	89·5	46	28	60·9	—	—
86	191	104	105	101·0	127	111	25	79	21	13	70	38	33	86·8	48	28	58·3	—	—
94	198	96	103	107·3	123	104	25	75	19	15	66	36	34	94·4	44	24	54·5	58	60
96	193	95	98	103·2	124	112	23	80	22	17	65	35	32	91·4	44	25	56·8	54	64
92	196	97	105	108·2	121	106	21	84	21	18	67	35	32	91·4	45	25	55·5	58	61
93·0	—	98·2	102·7	104·6	124·0	107·8	23·4	79·5	21·0	15·7	66·8	36·4	33·0	90·7	45·4	26·0	57·3	—	—
00	205	104	106	101·9	133	120	27	88	30	29	70	41	35	85·4	50	29	58·0	—	—
05	—	100	—	—	130	112	23	—	27	—	69	39	33	84·6	49	27	55·1	—	—

Of Nasal Aperture.			Of Maxilla.			Angles.			MANDIBLE.									
40 Height.	41 Width.	42 Index.	43 Length.	44 Width.	45 Index.	46 Facial (ophry. alv. auric.)	47 Naso-Malar.	48 Basilar.	Width.		Height.			54 Gonio-symphysial length.	Of Ramus.		57 Mandibular angle.	
									49 Bicondylar.	50 Bigoniac.	51 Symphysial.	52 Molar.	53 Coronoid.		55 Height.	56 Ant. post. breadth.		
46	28	60·9	—	—	—	66	130	31	123	102	34	—	72	99	67	39	110	
47	25	53·2	—	—	—	70	135	17	121	98	33	25	64	96	63	37	119	
54	27	50·0	61	67	110	—	137	29	—	—	—	—	—	—	—	—	—	
52	28	53·5	60	69	112	70	137	28	130	101	35	24	60	102	54	31	135	
48	29	60·4	59	67	113	—	134	29	—	—	—	—	—	—	—	—	—	
44	26	59·1	—	—	—	—	135	—	—	—	—	—	—	—	—	—	—	
48·5	27·1	55·9	—	—	—	67·5	134·8	26·8	—	—	—	—	—	—	—	—	—	
46	28	60·9	—	—	—	—	138	25	—	—	—	—	—	—	—	—	—	
48	28	58·3	—	—	—	69	139	29	—	—	—	—	—	—	—	—	—	
44	24	54·5	58	60	104	71	131	22	112	89	28	25	53	85	58	35	116	
44	25	56·8	54	64	118	70	138	22	—	—	—	—	—	—	—	—	—	
45	25	55·5	58	61	105	63	138	27	109	88	29	25	53	90	57	36	121	
45·4	26·0	57·8	—	—	—	68·2	136·8	25·0	—	—	—	—	—	—	—	—	—	
50	29	58·0	—	—	—	—	—	—	124	105	33	26	72	94	68	32	126	
49	27	55·1	—	—	—	—	—	—	119	93	31	24	66	89	65	35	123	

The malar bones are somewhat narrow from above downwards, and retreating laterally, but not to so great an extent as in the Tasmanians and Australians. A depression in the under surface of the malar process of the maxilla or "maxillo-malar notch" as it may be called, depending upon the development of the tuberosity and inferior edge of the malar bone, which is rarely found in Tasmanians and Australians, and indeed in many other races, as the Eskimo, is generally present in the Fijians, especially in the strongly-built males, though in most it is but slightly marked. The canine fossa is usually deep.

The form of the palate is rather intermediate between the parabolic and the hypsiloid, but often more inclined to the latter form. It is rarely V-shaped or hyperbolic, the form so common in the Andamanese. The index given by the measurement recommended in the French instructions is not very satisfactory, as the "points de repère," for these measurements, both length and width, are rather indefinite. The length terminates posteriorly at the palatine spine, a very variable point, sometimes greatly and sometimes but little developed, and giving no exact indication of the real length of the bony framework of the mouth, and, moreover, very often broken. The width also of the palate is very difficult to determine precisely by measurement of the internal face of the alveolar arch. I should therefore suggest using the external dimensions of this arch. The length should be taken from the alveolar point in front to the middle of a line drawn across the hinder borders of the maxillary bones (the "maxillary tuberosities" of human anatomy). This is easily measured by placing a card or a thin piece of metal across the back of the mouth, resting on each side in the groove between the tuberosity and the pterygoids. The width is best taken between the outer borders of the alveolar arch immediately above the middle of the second molar tooth. These may be called the maxillary length and width, and the index obtained from them called the maxillary index.

The following examples will show the value of this index in giving an idea of the general form of the maxillary bones. In the gorilla it is 69. In a Tasmanian, which presents in a striking degree the hypsiloid form approaching that of the Anthropoids, it is 106; in an Australian of similar form, 107. The Eskimo, which present the greatest contrast to the Australians in the form of the alveolar arch, have an index (average of 4) of 124. Ten English skulls give an average of 117, and the indices of the six Fijians whose alveolar arches are sufficiently perfect to admit of measurement, vary between 105 and 118, giving an average of 111. Their position in this respect therefore appears to be between the European and the Australian.

There now remains the very important question of the position of the upper jaw with regard to the cranium, *gnathism*, as it may be called, the variations of which in the human subject depend, as Topinard has shown, mainly upon the form of the portion of the jaw below the nasal spine; in fact, upon the degree in which the anterior portion of the alveolar process of the maxilla (pre maxilla being of course included in this term when speaking of the human jaw) recedes towards the base of the cranium, or projects forwards. Although in a refined and perfect system of craniometry it may be desirable to investigate the relations of the face, independently of its sub-nasal position, to the cranium and to separate the different elements which produce the condition generally known as prognathism, it is clear that in estimating this condition as a whole, the alveolar point is the most important for consideration, and it is the position of this point in relation to some fixed line in the cranium which has to be determined.

The best and most convenient base line of the cranium appears to me that which Huxley calls the "cranio-facial" axis, or the basio-nasal line, joining the basion (B, Plate XII) and the nasion (N); and, practically, gnathism depends upon the relation of the alveolar point (A) to this line. If any line or axis of the cranium ending in front above the nasion is used, a new element is introduced—that of the form of the frontal bone, which should be kept quite distinct, for although required in estimating the whole "facial angle," it has nothing to do with "gnathism" as was clearly shown in Professor Huxley's paper "On two widely contrasted Forms of the Human Cranium."* In what may be called the average or generalised condition of the human skull the points N (nasion), B (basion) and A (alveolar point), form a triangle of which the two sides BN and BA are equal. Such skulls may be called mesognathous. Prognathism and orthognathism consist in the advance or recession of the point A, which may be due to one of two causes, or, as is more often the case, to both combined: 1. A rotation, or perhaps rather sliding forwards or backwards of the maxillary and adjacent bones, "a shifting forwards of the centre of the palate," as Huxley expresses it. 2. Variation in the size of the maxilla itself; macrognathism being generally found in the macrodont, or large-toothed races. In comparing the skull of a gorilla with that of a man, it will be readily seen that both these causes combine to make the great difference between the two crania, strikingly seen in the immense increase of the length of the line BA over BN in the former. The amount contributed by each factor can easily be estimated by dividing the line BA at the point where it crosses the hinder

* "Journal of Anatomy and Physiology," vol. i, p. 75, 1867.

margin of the maxilla, when it will be seen that both the maxillary length and the space between the maxilla and the basion are increased. The same will be found in the black races of men, though in a far less degree. But, by whatever cause produced, the length of the line BA compared with that of BN expresses the measure of *gnathism* of the skull quite as accurately as any of the other methods by angles or indices which have been proposed, and its extreme simplicity and facility of application gives it great advantages. It fails certainly in cases of platybasic deformity, when the elevation of the basion causes it to approach nearer to the nasion; but such cases are rare, and can readily be detected by the eye, and then the method must be exchanged for some other. It fails also, but in common with all other methods, when loss of incisor teeth or other cause has led to the destruction of the alveolar point.

One other source of fallacy, which applies equally to this method of estimating gnathism, as to the angular one, in which A is taken as the apex of the angle measured (as by the French anthropologists), must also be pointed out. It is affected by variations in the height of the face (the line NA), when unaccompanied by similar and proportional variations of the length BN. Thus, of two faces of different lengths, in which BN and the angle BNA, are equal, the shorter one will appear the more orthognathous of the two. This probably does not amount to much practical importance, but if on a more extended and critical examination it should be found to do so, where rigid accuracy is required it will be necessary to resort to the angle itself, which can be calculated from the dimensions BN, NA, and AB, by the application of the principles of trigonometry.*

For the index which expresses the ratio between the lines BA and BN I have used the term "alveolar index,"† but Mr. Busk had previously proposed the more expressive "gnathic index" for one denoting very nearly the same relationship. I should very much prefer to adopt this term in future, as it is scarcely possible that the slight difference between them (Mr. Busk using the auditory meatus instead of the basion as the apex of the triangle) will lead to any ambiguity.

In the series of skulls before us only eight, four males and four females, have the alveolar margin sufficiently complete

* The angle of prognathism or premaxillary angle suggested by Prof. Huxley has its apex at the anterior termination of the basi-cranial axis, or the junction of the presphenoid and ethmoid bones, and its limbs passing the one through the basion, the other through the alveolar point. The principle is therefore the same, but practically it is not so convenient.

† "Journal of the Anthropological Institute," vol. ix, p. 119. and "Catalogue Osteology and Dentition of Vertebrated Animals," Coll. of Surgeons Museum (1879).

to afford the requisite measurements. Of these, in one (No. 1025) the basio-alveolar line just equals the basio-nasal line in length, in all the others it exceeds it. The females happen to be much more prognathous than the males, but the series is too small to draw satisfactory conclusions as to the characters of the two sexes. The general average of 103·7, shows that as a race they enter into the prognathous category,* though not to the extreme degree of the Australian or African negroes.

It has long been felt that in comparing crania one with another actual measurements are of little value unless reduced to terms of some common dimension. The great difficulty has been to find the dimension which is best suited for this purpose. Professor Huxley has suggested the basi-cranial axis (basion to upper end of the ethmo-presphenoid suture),† but this has several disadvantages. It can only be measured in a skull which has been bisected, and it is so short that small variations in its length, or slight inaccuracies in its measurement produce great apparent effects upon the resultant ratios.

In the cranio-facial axis (BN), the first inconvenience is entirely and the second very considerably obviated. There is certainly an element of variability introduced, independent of the actual size of the skull, by the inclusion of the roof of the nasal chamber, and the thickness of the lower border of the frontal bone; but putting aside occasional individual variations, this is one of the most constant dimensions of the cranium, and if not safe to apply to a single skull, will, I think, if averages of a sufficient number of specimens be taken, afford a good standard for comparison.

The constancy of this dimension, the variations having relation apparently only to the general size of the framework of the base of the skull, may be illustrated by the following table of its average length in different races :—

							Millimeters.
17	♂	Eskimo	..	..	..	..	106·1
7	♀	"	..	..	..	..	99·5
6	♂	Fijian Mountaineers	..	..	..	..	104·0
5	♀	"	..	..	..	..	98·2
28	♂	Negroes	..	..	..	..	101·9
30	♂	Australians	..	..	..	..	101·3
20	♀	"	..	..	..	..	94·6
40	♂	Italians	..	..	..	..	101·7
20	♀	"	..	..	..	..	94·0
100	♂	British	..	..	..	..	100·9
50	♀	"	..	..	..	..	94·6
40	♂	Peruvians	..	..	..	..	100·5
16	♂	Chinese	..	..	..	..	99·0
12	♂	Andamanese	..	..	..	..	95·0
12	♀	"	..	..	..	..	90·7

* The gnathic indices may be thus divided. *Orthognathous* below 98. *Mesognathous* 98 to 103. *Prognathous* above 103.

† *Op. cit.* p. 72.

Of 100 skulls of male natives of the British Isles of various districts, and different periods of time, the range of the cranio-facial axis is between 91 and 111, but these figures are perfectly exceptional. Four-fifths of the whole number are between 96 and 106, and more than half between 99 and 103. In the examples of the length of the basio-cranial axis given by Professor Huxley, the range of individual variation appears to be quite as great, but as I said before, it is not with individuals, but with averages, that the comparisons must be made in order to obtain satisfactory race characters.

As an example of this method of investigation I have placed side by side the principal dimensions of the crania of the two groups of mankind described in this and my last communication, reduced to the terms of their respective cranio-facial axes, in order to see if any useful conclusions can be drawn from them.

AVERAGE measurements of six crania of male Fijians (mountaineers of Viti Levu) and of twelve male Andamanese, reduced to terms of their respective cranio-facial axes; this dimension (BN) being 104 m.m. in the former and 95 m.m. in the latter series:—

	Fijian.		Andamanese.	
Capacity*	..	144 ..	..	131
Length	..	188 ..	..	176
Height	..	137 ..	..	136
Maximum breadth (parietal)	..	123 ..	..	142
Minimum frontal	..	93 ..	..	97
Maximum " } breadth	..	106 ..	..	117
Biauricular " }	..	112 ..	..	120
Occipital	..	106 ..	..	108
Total horizontal circumference	..	512 ..	..	505
Pre-auricular circumference	..	231 ..	..	224
Vertical transverse circumference	..	417 ..	..	432
Transverse Arcs—				
Frontal	..	278 ..	..	278
Bregmatic	..	289 ..	..	300
Parietal	..	304 ..	..	329
Occipital	..	266 ..	..	263
Longitudinal Arcs—				
Frontal	..	130 ..	..	127
Parietal	..	138 ..	..	129
Occipital	..	118 ..	..	109
Length of foramen magnum	..	33 ..	..	35
Total vertical median circumference (excluding BN)	..	425 ..	..	401
Basio-alveolar length	..	103 ..	..	101
Bizygomatic diameter	..	131 ..	..	132
Bijugal "	..	115 ..	..	118
Inter-orbital "	..	25 ..	..	25
Height of face	..	80 ..	..	87
" malar	..	25 ..	..	24
Auriculo-orbital length	..	65 ..	..	66
Width of orbit	..	38 ..	..	38
Height "	..	32 ..	..	35
Height of nose	..	47 ..	..	48
Width "	..	26 ..	..	25

* Number of cubic inches divided by number of millimeters in cranio-facial axis.

A glance at the above table will show that most of the important differences in conformation between the two sets of crania are clearly brought out by the figures.

In the first place the general capacity of the interior of the cranium in the Fijians is larger in relation to the axis than it is in the Andamans. This is accounted for mainly by the fact that the whole median longitudinal arc from the fronto-nasal suture passing over the vertex to the basion is longer in the Fijians as compared with the axis than it is in the Andamanese in the proportion of 425 to 401. The total horizontal circumference is also larger but in a less degree (512 to 505), the preponderance being entirely in the preauricular portion, the diminution in the post-auricular circumference in the Fijians being evidently associated with the diminished width of the parietal region. From the same cause the vertical transverse circumference is less in the ratio of 417 to 432. It is interesting to note that the Andamanese brachycephalic cranium has, contrary to what is often supposed, a larger post-auricular circumference than the Fijian, in which "occipital dolichocephaly" is so strongly marked.

The relative greater length of the Fijian skull even to its own much elongated cranio-facial axis is shown by the figures 188 to 176. The heights of the two are nearly equal, while as might be supposed from the most superficial comparison of the crania, the transverse diameters are, in the Fijian, diminished in every case, but most in the parietal and least in the occipital region. The comparison of the biauricular diameters is interesting, as it shows that, quite irrespectively of the form of the upper part of the brain case, its foundation, as it were, is relatively much narrower in the Fijian than the Andamanese. The comparison of the maximum with the biauricular breadth is also instructive. In the Fijians the increase of the former over the latter is only as 110 to 100, in the Andamanese as much as 118, showing the comparative flatness of the whole side of the cranium in the Fijians. Comparison of the transverse arcs gives equality in the frontal region, preponderance in the bregmatic, and especially in the parietal regions to the Andamanese, and in the occipital to the Fijians. The longitudinal arcs of all three bones are greatest in the Fijians, but the difference is most strikingly seen in the occipital. Thus in every relation the small size of the occipital region of the Andamanese, pointed out in the memoir on the race, becomes evident by this comparison. The greater prognathism of the Fijians is seen in the increased basio-alveolar length. The relative auriculo-orbital lengths are almost identical. The bizygomatic diameters differ but slightly, but the comparative diminution of the bijugal breadth in the Fijian points to a

narrowing of the fore part of the zygomatic arch and malar bones. The shortness of the whole face of the Fijians is conspicuous, and the difference in the comparative dimensions and consequently in the form of the orbits and nasal apertures are well seen. The orbits being relatively of the same width, gain in height in the Andamanese, while in the same people the nose is higher but narrower than in the Fijians, giving proportions which are also shown in the orbital and nasal indices.

The teeth have unfortunately been lost, either partially or wholly, in all the skulls, in some cases owing to old age, but in most from having fallen from their alveoli after death. Those that remain are strong, well formed, and free from decay. They are of large size, though perhaps not equal to the Tasmanians or Australians. The upper incisors show considerable dental prognathism. The first lower molar has five distinct cusps, and the wisdom teeth appear always to have been well developed and never misplaced, as is so often the case among the Tasmanians; in the skull of a young person (No. 1136) they have taken their position in the jaw, before the closure of the basilar suture.

The two skulls of Kai Colos from Voresika in the Na Drau district, both adult males, resemble those above described in all their essential characters, as is seen in the table of measurements and indices, and so far tend to show that these characters are not peculiar to the Ngalimari tribe, but are those of the islanders generally. They do not, however, show the extremely small latitudinal index of some of the others, and they differ (especially No. 1139) in presenting a greater malar depth with a consequently better marked maxillo-malar notch. In 1139 all the teeth are perfect. In No. 1140, the four upper incisors, and the second and third upper molars of the right side, and the third upper molar of the left side have been lost during life, while all the other teeth are perfect and not much worn. The incisors may have been knocked out in some initiatory or propitiatory rite, but the loss of the molars must be from other cause.

In 1139, globular bony growths from the hinder wall of the meatus auditorius almost completely occlude the passage.

The series of skulls from the coast of Viti Levu, Bau, and the island of Ovalau, mostly from the latter place, consists of seven adults, and six in which the basilar suture is not united. In the adults the sexual characters are less marked than in the preceding, and I have therefore not separated them in computing the averages. Though on the whole presenting many essential

CRANIA FROM THE COAST OF VITI LEVU AND OVALAU.

Number in Catalogue.	Sex.	Length.	Breadth.	Lat. index.	Height.	Height index.	BN.	BA.	Gnathic index.	Nasal height.	Nasal width.	Nasal index.	Orbital width.	Orbital height.	Orbital index.
R. Coll. Surgeons 1141	♂	178	123	69.1	138	77.5	107	107	100.0	51	26	51.0	42	35	83.3
" " 1142	♂	189	137	72.5	140	74.1	105	107	101.9	50	27	54.0	40	36	90.0
" " 1146 A	♂	190	127	66.8	137	72.1	100	105	105.0	50	25	50.0	37	32	85.5
Coll. B. Davis 1644	♂?	193	132	68.4	139	72.0	104	110	105.8	49	25	51.0	39	34	87.2
" " 1146 B	♀?	184	124	67.4	133	72.3	98	106	108.2	47	26	55.3	39	36	92.3
" " 1146 C	♀	179	125	69.8	131	73.2	99	101	102.0	46	25	54.3	39	33	84.6
Coll. B. Davis 233	♀	183	123	67.2	129	70.5	94	101	107.4	45	24	51.1	37	32	86.5
Averages	...	185.1	127.3	68.8	135.3	73.1	101.0	105.3	104.3	42.6	25.4	52.4	39.0	34.0	87.2

CRANIA FROM VANUA BALAVU.

R. Coll. Surgeons 1143	♂	192	138	71.9	145	75.5	108	106	98.1	53	26	49.1	41	35	85.4
" " 1144	♂	191	132	69.1	138	72.3	110	110	100.0	53	25	47.2	41	36	87.8
" " 1145	♂	189	131	69.3	143	75.7	106	104	98.1	53	28	52.8	41	36	87.8
Coll. B. Davis 1645	♂	180	132	73.3	140	77.8	104	105	101.0	52	25	48.2	40	37	92.5
" " 1646	♂	190	144	75.8	145	76.3	103	110	106.8	53	28	52.8	40	35	87.5
" " 1643	♂	192	136	70.8	145	75.5	110	109	99.1	57	29	50.9	42	35	83.3
Averages	...	189.0	135.5	71.7	142.8	75.5	106.8	107.3	100.5	53.5	26.8	50.1	40.8	35.7	87.2

characters which show affinity with the Kai Colos, and though some could not be distinguished from them, but would well find a place even among the Ngalmari, as a series they are considerably less uniform. None of the males are so large or powerfully built as the Kai Colos. The average latitudinal index, though still very low, is somewhat greater, viz., 68·8, and in one (No. 1142) this index is as high as 72·5. One of the young skulls (No. 1141 D) has remarkably prominent parietal eminences, though in other parts of the cranium the usual narrowness prevails. Contact of the squamosal and frontal bones occur in three cases of the thirteen, in each case on one side only; in one, however, to the extent of two centimeters, in both the others only slightly. Epipteric bones are frequent (six cases) and the sphenoparietal suture is always short. One (No. 1046 A) has no trace of sagittal suture, though the other usual sutures are all open. This does not appear to be accompanied by any appreciable alteration in the form of the skull. The gnathic index varies between 100 and 108, the average being 104·3. The nasal index from 50 to 55·3, the average being 52·4. The orbital index from 83·3 to 92·3, the average being 87·2.

The last series consists of six skulls, all apparently those of males, and all adults, from Vanua Balavu, one of the Lau or Windward Islands. They are all thick-walled, heavy skulls with strongly marked muscular processes and brow-ridges. In other respects they present considerable individual variations, the latitudinal indices, for example, varying between 69·1 and 75·8. Indeed it is very difficult to describe them as a whole, as they give a decided impression of belonging to a mixed or hybrid race. Knowing to what an extent intercourse has taken place between the Lau Islanders and the Tongans, it becomes extremely interesting to endeavour to ascertain whether the modification from the pure Fijian type seen in these skulls can have been derived from this source.

For this purpose it would be necessary to establish thoroughly the cranial type of the Tongans, which, as mentioned before, is totally distinct from that of the Fijian, being perhaps the purest Polynesian. Unfortunately, I have not at hand means to do so, Tongan skulls being rare in collections in this country, but the Museum contains five crania, all probably of males, two from the Ellice Islands, two from Samoa, and one from Tonga, which agree so well in general characters, and correspond also with skulls from the same part of the Pacific figured by Dr. J. W. Spengel, that averages derived from their principal dimensions may, at all events in default of better information, be taken with tolerable safety as indicating the characters of the race whose intercourse with the Fijians of the Windward Islands may have led to a modification of the physical characters of the latter.

In the following table I have put down what appear to me the most important of the cranial indices of the four series of crania spoken of in this communication, taking for greater accuracy of comparison, the males only of each series, and arranging them according to their geographical position; the pure Fijians from the interior of the Western end of Viti Levu; next, the Fijians from the east coast of the same island and from Ovalau; thirdly, the Fijians from the islands situated 150 miles from Viti Levu in the direction of the Tonga and Samoan Islands; lastly, the inhabitants of the latter islands, probably of pure Polynesian blood. I am fully aware that each series is far too small for a satisfactory average, but the result is certainly remarkable, that in each character (and it must be remembered that these are not characters selected for the purpose, but were determined upon before commencing the comparisons; in fact, they are those selected some years ago for the Museum Catalogue, as the most important) a gradual transition is observed in passing from the first to the last series. Every departure from the type of the pure Fijian of the interior exhibited by the coast or island people is in the direction of the Polynesian, and the change is greater the nearer the geographical centre of the last named race is approached. The only exception in the whole series of figures is in the gnathic index of the mountain and coast Fijians, but this is probably due to the insufficient number of examples, the average in the first case being derived from only four.

	Latitudinal index.	Altitudinal index.	Gnathic index.	Orbital index.	Nasal index.
6 Kai Colos of Viti Levu	65·6	73·1	*	84·5	55·9
7 Coast and Ovalau Fijians	69·2	73·9	103·2	86·7	51·5
6 People of Vanua Balavu	71·7	75·5	100·5	87·2	50·1
5 Samoans, Tongan, and Ellice Islanders†	82·6	78·1	98·2	92·3	44·3

It is certainly a remarkable proof of the value of the numerical method of expressing cranial characters, that not-

* Comparison with the female skulls of this series will show that this index is too low to represent that of the race.

† A very fine and characteristic skull of a mae Samoan, in the museum of the University of Oxford, gives the following indices: lat. 84·4, alt. 81·6, gnathic 98·1, orbital 100, nasal 44·1.

withstanding the limited number of specimens disposable, such striking results should be obtained.

The single skull presented to the Museum by Dr. Hobson and figured by Martin as a Fijian, differs completely from the natives of Viti Levu, and even from any of the islanders. In its broad parietal regions (index 78·2), round high orbit (index 100), diminished prognathism (index 98·2) and small teeth, it presents far greater affinities to the Polynesian than to the Melanesian type. The nose alone of all the features bears any resemblance to that of the Kai Colos, but it is still longer from above downwards, and of lower index (53·7) than the average of that race.

Of the cranial characters of the inhabitants of the second great island of the Fijian group, Vanua Levu, we at present know nothing. With regard to Viti Levu, all the evidence we possess shows that the people who inhabit the interior of the island present in their cranial conformation a remarkable purity of type, and that this type conforms in the main with that of the Melanesian islands generally; indeed, they may be regarded as the most characteristic, almost exaggerated expressions of this type, for in "hypsistenocephaly" they exceed the natives of Fate, in the New Hebrides, to whom the term was first applied.

The intermixture of Tongan or other Polynesian blood with the Fijian appears to be confined to the smaller islands, and even in these not to have very greatly modified the prevailing cranial characteristics. The idea that at some former period the Polynesians had effected an extensive settlement in Fiji, receives no support from the specimens in these collections.

It is probable that much light would be thrown upon the history of events in the Pacific Ocean, if we could obtain a sufficient series of crania from each of the islands, especially from old burial grounds. Distinguishing characteristics of conformation would be traced in each. Some of these might be shown to have arisen from mixture, in various proportions, of different races; others from slight modifications gradually becoming intensified and perpetuated by isolation. To the latter cause the Tasmanians probably owe their peculiar cranial conformation. The isolation of island communities, though in most cases far from complete, protects them to a certain extent from the levelling influences of the constant intercourse, through war and commerce, of tribes living on continents, and the study of natives of such communities may be expected to aid in solving some of the problems connected with the causes of the variations in the human species.

NOTES TO THE TABLE OF MEASUREMENTS.

For convenience of comparison, the greater number of the cranial measurements given correspond to those recommended in the "Instructions Craniologiques et Craniometriques" drawn up by Broca, and published by the Anthropological Society of Paris in 1875.

Certain cases of deviation from these instructions will however require explanation:—

1. *Capacity.* The cranial cavity is filled to the utmost with mustard seed, poured into the foramen magnum through a funnel of narrow aperture. When about half full the shaking and tapping on the sides of the cranium required to cause the seed to settle closely together is commenced, and it is continued at intervals until the cavity is quite filled. The surface of the seed at the foramen magnum is then firmly pressed with the thumb, to cause the seed to fill up the temporal fossæ. As much seed as may be necessary is added to fill up to the level of the margin of the foramen. The seed is then measured by pouring through the same funnel into a graduated glass vessel, frequently shaking and tapping the sides as before, so as to obtain a maximum of compression in each case. This method, if pursued with care, has been found by numerous experiments to give perfectly satisfactory results.

2. The length is measured from the ophryon to the most distant part of the occiput, but for the convenience of those who prefer to include the glabella, a second measurement is given from this point.

14 to 17. The transverse arcs are measured with the tape, from the spot on the ridge (posterior root of zygoma) immediately above the middle of the external auditory meatus, where it is crossed by the auriculo-bregmatic line (line from the centre of the auditory meatus to the bregma.) They pass to the corresponding spot of the opposite side over the most prominent part of the frontal, parietal, or occipital bones, as the case may be, or the bregma (No. 15.) The last corresponds with the *courbe sus-auriculaire* of Broca.

23 to 26. The projections are taken when the cranium is placed on a board, with a line representing the visual axis, *i.e.* a needle passing through the optic foramen and the centre of the anterior aperture of the orbit (fixed by Broca's orbitostat) horizontal. The cranium is regulated in this position by means of thin pieces of wood placed under the occiput. The board has a pin to receive the basion, and a scale running backwards and forwards from this point on which the measurements are

read by means of a square. The facial projection is the part in front of a vertical line passing through the ophryon (Plate XII, Figs. 1 and 2, AF); the anterior cerebral, the portion between this and a vertical through the basion (FB); the posterior cerebral, that part situated behind the basion (BO).

29. The gnathic (formerly called alveolar index) is fully explained at p. 163.

46. The facial angle is that of which the alveolar point is the apex, and of which the limbs pass through the ophryon and the auricular point respectively, taken by Broca's median goniometer.

47. The naso-malar angle is explained at p. 160.

48. The basilar angle is formed between a prolongation of the basio-nasal line and the plane of the foramen magnum, the apex being at the basion. (NBY of the "Instructions," p. 92.)

The measurements of the mandible correspond with those of the "Instructions" except that Nos. 3, 9, 10 and 12 are omitted, and one is added, the coronoid height (No. 53) being the vertical distance between the summit of the coronoid process and the lower border of the maxilla.

DESCRIPTION OF THE PLATES.

All the figures are from specimens in the Museum of the Royal College of Surgeons of England. They are drawn on a geometrical projection, the outline being traced by means of Broca's stereograph and then reduced one-half. The plane of the visual axis (a line passing through the optic foramen and the centre of the anterior aperture of the orbit) is horizontal in the figures in Plates XII and XIII and Fig. 1 of Plate III, vertical in Fig. 2 of Plate XIV.

The numbers refer to the catalogue of the Osteological specimens (1879.)

AO, Line parallel with visual axis passing through the basion. The perpendiculars to this line at A, F, B and O, divide the different segments of the cranial projection. AF, Facial; FB, Anterior cranial; BO, Posterior cerebral.

BN, Basio-nasal line (cranio-facial axis); BA, Basio-alveolar line.

Plate XII.—Side view of skull.

Fig. 1.—Male, No. 1127.

Fig. 2.—Female, No. 1134.

Plate XIII.—Facial view of skull.

Fig. 1.—Male, No. 1127.

Fig. 2.—Female, No. 1134.

Plate XIV.

Fig. 1.—Upper surface, Male, No. 1126.

Fig. 2.—Posterior surface of the same.

DISCUSSION.

THE PRESIDENT inquired whether these Fiji mountaineers with large heads of hair being pure Melanesians, would, in Prof. Flower's opinion, go against the common view that the mop-headed Papuans owe their peculiarity of hair to mixtures between Malay and Melanesian. He remarked that though Prof. Flower treated the cephalic index as only a subordinate cranial character, he practically showed it in the case of these most dolichocephalic people to be a most valuable race-mark. He called the attention of the meeting to the interesting series of cranial measurements, where four sets of indices in a crossed race showed intermediate dimensions between the two purest races, which as a reduction of hybridity to measurement was a most instructive result, never previously equalled.

Dr. ALLEN THOMSON expressed the pleasure with which he had listened to Prof. Flower's interesting description of the series of Fiji skulls exhibited to the Institute for the first time, in which the Professor continued his able and accurate application of the newer methods of craniological examination and description to the distinction of the races of mankind, as inaugurated by Broca and others, and in connection with which Prof. Flower from his intimate acquaintance with the subject, and his unrivalled opportunities, was enabled to make important contributions to ethnological science. Dr. Thomson had never before seen such remarkable examples of Dolichocephaly, without scaphocephalic difformity, as were presented by these skulls, and could not help regarding them as indicating a distinctive race or family character. Dr. Thomson congratulated Prof. Flower and the Institute on the recent acquisition by the Museum of the Royal College of Surgeons of Dr. Barnard Davis' rich collection of Crania and Skeletons belonging to different races, from which, notwithstanding the large amount of intelligent work bestowed upon it by its former possessor, new and useful information may be confidently expected in its association with the collection of the College from the investigations of Prof. Flower.

The ETHNOLOGY of GERMANY.—PART V.

THE JUTES AND FOMORIANS.

By H. H. HOWORTH, Esq., F.S.A.

IT is the almost invariable result of taking a new step in ethnology as in other sciences, that we are obliged to modify considerably our views along the whole line. The fresh vantage that we gain enables us to see that what was formerly held as