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A Craniometric Study of the Micmac Skull in the Povincial Museum of Nova Scotia.

— By John Cameron, M. D., D. Sc., F. R. S. E., F. R. S. C., *Professor of Anatomy*, Dalhousie University, Halifax, N. S.

(Read 10 March, 1919).

The Micmac Indians are generally regarded by ethnologists as a branch of the important and influential Algonquian group which once held sway over a considerable area of North America. They constitute the aboriginal inhabitants of Nova Scotia, Prince Edward Island, and the northern portions of New Brunswick, while there is evidence to indicate that they even extended at one time to the neighbouring western portion of Newfoundland, and came no doubt into intercourse with the Beothuck aborigines of that island.[1] Jacques Cartier,[2] the French navigator, appears to have been the first European to have cast his eyes on the Micmac Indians whom he mentions as having seen on the shores of Chaleur Bay, New Brunswick, in 1534. Since that time much has been written on the subject of this interesting people, and an

excellent bibliography up to 1911 will be found furnished by Mr. H. Piers[3] in Vol. XIII of these Transactions. A general survey of these memoirs indicates, however, that the history, customs, manners, beliefs, language and literature of this tribe have been the subjects mainly dealt with, and, as Mr. Piers[3] himself states,—"no data are available regarding measurements of Micmac skulls, etc., whereby we might compare them with those of other tribes." Hrdlicka[4] in his elaborate memoir on the Physical Anthropology of the Eastern Indians of the United States likewise makes the significant statement, that "Much also remains to be done with respect to the Algonquians. The Canadian tribes have scarcely been touched as yet."

The Micmac Skull which forms the subject of this memoir is the only specimen in existence in the Nova Scotia Provincial Museum, and also as far as I can ascertain, in the Province. The writer wishes to express his indebtedness to Mr. H. Piers, the Curator of the Museum, for the privilege of having examined the skull, and also for being granted permission to make a mesial sagittal section, in order to investigate the various important basal angular measurements.

The descriptive label attached to the specimen briefly states that it is the "skull of a Micmac Indian, killed at Four Mile House, Bedford Basin, near Halifax, during the construction of the railway to Windsor in 1854." It was presented to the Museum in 1872 by the late Dr. William H. Weeks of Dartmouth, N. S., who was then a coroner of Halifax County. Mr. Piers informs me that the original label of this Micmac skull, in the writing of Dr. Honeyman, former curator of the Provincial Museum, merely states that it is a "Micmac's skull." Dr. Honeyman, however, told Mr. Piers, that it was the skull of a Micmac who had been killed at Four Mile House (now Rockingham) during the construction of the railway there. The railway from Halifax to

Windsor was being built in 1854. The fuller label was attached to the specimen by Mr. Piers in accordance with this information. Dr. Honeyman in his Museum report for 1872 states that the skull was presented by Dr. Weeks in that year. Weeks graduated in 1859, so that he must either have obtained the skull in his early student days; or, if he obtained it during the time he was coroner, the date when the man was killed must have been later than 1859, and the accident then must have occurred during repairs to the railway. Now a point of difficulty at once manifests itself, for it is a well recognized fact that there was in the early colonization days a certain degree of intermingling of Micmac and French Acadian blood. In the midst of these difficulties, we possess no record as to whether this skull belonged to a full blooded Micmac Indian or not. Fortunately, however, this is just where Science is able to bridge across the *hiatus* and demonstrate to us that many of the indices and other cranial measurements of this specimen suggest Mongoloid affinities which the skull of the North American Indian in general tends to manifest in some degree or other. On the whole therefore, I am inclined to believe that this skull was that of a pure blooded North American Indian. It is a matter for deep regret that the physical anthropology of the aboriginal inhabitants of Nova Scotia is represented in the Provincial Museum merely by a single skull. My main purpose therefore, in writing this paper is to direct attention to an obviously anomalous condition, and at the same time to appeal to those interested in anthropology to endeavour to rectify this state of affairs by collecting specimens. I would personally be most grateful for any information regarding the location of genuine old Indian burial sites for purposes of exploration. There is admittedly a certain degree of antipathy towards disturbing the dead and desecrating their graves in a search for relics and other remains,yet, in the absence of adequate literature, one must not allow the records of the manners, customs, and

beliefs of this ancient race to vanish into oblivion. The human memory is notoriously short, and that is just where our Museums subserve their functions as monuments of the past, and keep reminding us of the aboriginal inhabitants, and the ancient history of our Province, "lest we forget." It is to be clearly understood that the various measurements and indices of this skull are not to be taken as representative of the craniology of the Micmac Indian. This can only be ascertained after examining hundreds of specimens, hence my earnest appeal for initiating the collection of suitable material, the authenticity of which is beyond all dispute.

In Dawson's *Acadian Geology*[22] are two illustrations representing a Micmac woman and her son. Although these are not modern photographic reproductions they convey a fairly good impression of the average type of facial feature that characterized this Indian tribe. The features of the woman are regular and exhibit no evidence of prognathism, though the brow is rather low and receding. The features of the man, who probably had a slight admixture of French-Acadian blood, are also well modelled, though the lips, are somewhat heavy and pouting. The forehead looks higher than that of the woman and is better developed on the whole. It is good to have these racial types represented on the pages of a standard scientific work, as they permanently represent a race that has been condemned, or at any rate foredoomed by civilisation, either to die out, or lose its individuality by becoming merged in the white population through intermarriage

General Description of the Skull.—The outer table had evidently been artificially darkened by some unknown means as it was almost coal black in colour. The skull was rather delicately moulded, and tended in fact to suggest the female type. The superciliary ridges were faintly marked and the supraorbital margins rather sharp in outline. The mastoid

and styloid processes and the curved lines of the occipital were poorly shown, so that the individual had evidently not possessed much virile muscular development. In reference to this fact it is significant to note Hrdlicka's[4] remarks on his extensive series of Lenape North American Indian skulls in which he found no "massiveness, no heavy supraorbital arches or crests, no heavy jaws. It was plain that they did not belong to a tribe of great hunstmen or warriors."

A large slice of bone had been cut out from the right half of the cranial roof for some unknown rèason, so that it was impossible to estimate the cranial capacity in the usual way (See Fig 13). The bones of the skull were rather thin, being not more than 4 or 5 mm. in thickness. I could not detect any Wormian bones. There was no metopic suture and the frontal did not articulate with the temporal bone on either side. The lower portions of the temporal fossae were rather deep, the space between the inner surface of the zygoma and the great wing of the sphenoid measuring 24.5 mm., which is more than the average in the modern Canadian skull and is nearly as extensive (25.5 mm.) as in a Melanesian skull It is indicated of course that at any rate the temporal muscle showed robust development, no doubt in accordance with a vigorous and unethical mode of mastication that had been adopted by the individual. The lower jaw was unfortunately awanting. The teeth had all dropped out of the upper jaw but all the alveoli were present and of normal depth, although some of their front walls had become broken away (see Fig. 11). The frontal air sinuses were rather small as was to be expected from the feeble degree of development of the superciliary ridges. (See Fig. 11). The various foramina for emissary veins were well represented. Both mastoid and both posterior condylar foramina were present. The parietal for amen and the inconstant emissary foramen of Vesalius were exhibited on the left side. The foramen caecum was well shown.

The approximate Age of the Skull.—The sutures were practically obliterated on the internal surface of the skull, which would suggest an individual somewhat beyond middle life. The coronal and the sagittal sutures were all synostosed externally, and therefore rather indistinct. The lambdoidal suture was, however, still definitely marked along its whole length, while the squamous suture was likewise quite apparent. It is a striking fact that the synostosis of these latter sutures usually follows that of the coronal and sagittal. The teeth had all dropped out of their sockets so that no evidence as to age could be ascertained from that criterion.

The Cranial Measurements.

Cubic capacity of skull (approximate)	1495	cu. cm.
Maximum length	182.5	mm.
Inion-glabellar length	173.5	mm.
Maximum breadth	147.5	mm.
Basion-bregmatic height	133.5	mm.
Basion-nasion length	104	mm.
Basion-alveolar length	104	mm.
Nasal height	51	mm.
Nasal width	25.5	mm.
Orbital height	40.5	mm.
Orbital width	46	mm.
Minimum post-orbital breadth	105.5	mm.
Inter-stephanic breadth	112.5	mm.
Inter-zygomatic breadth	135	mm.
Horizontal cranial circumference	53.34	cm.
Vertical transverse circumference	44.15	cm.
Maxillo-facial height	63.5	mm.
Inter-malar width	119	mm.
Palato-maxillary breadth	64.5	mm.
Palato-maxillary length	57.5	mm.
Dental length	47.5	mm.

Antero-posterior diameter of foramen magnum	36	mm.
Calvarial height	98.5	mm.
Bregmatic angle	60°	
Spheno-maxillary angle	95°	
Spheno-ethmoidal angle	157°	
Foramino-basal angle	146°	
Glabella-bregma chord	100.5	mm.
Maximum distance of chord from frontal cranial arc	20	mm.
Bregma-lambda chord	109.5	mm.
Maximum distance of chord from parietal cranial arc	26	mm.
Lambda-inion chord	62	mm.
Maximum distance of chord from occipital cranial arc	10.5	mm.
Maximum depth of temporal fossa	24.5	mm.

The Cranial Indices.

Cephalic index	80.8
Height index	73.09
Breadth-height index	90.5
Alveolar index	100
Orbital index	88.04
Nasal index	50.
Maxillo-facial index	47.03
Stephano-zygomatic index	83.3
Fronto-parietal index	71.5
Calvarial Height index	56.7
Palato-maxillary index	112.1
Dental index (approximate)	45.6

The Horizontal Cranial Circumference.—This was measured over the glabella, according to the plan of Turner,[5] and proved to be 53.34 cm., which was practically the same as the average for 108 male Scottish skulls, namely 53.1 cm., as

found by Turner[6] in his classic research on the Craniology of the people of Scotland. This result was likewise found to accord almost exactly with the corresponding measurements of two low-grade Melanesian skulls recently recorded by the author in Vol. XIV of these Transactions.[7] It is evident, then, that there is a very slight inter-racial range of variation in this cranial measurement, even between the highest and the lowest types of modern Hominidae. As I pointed out in the above mentioned memoir, the horizontal cranial circumference clearly does not possess much craniological significance, though it shows that the cranial roof situated above this level is the essential portion of the skull that has been forced to expand in order to create more space for the evolving brain in the higher races of mankind.

The Vertical Transverse Circumference.—This was measured according to the plan of Turner[6] and was found to be 44.15 cm., which closely approximates to 43.4 cm., that being the average ascertained by Turner in 103 male Scottish skulls.[6] As a matter of fact this circumference must have been a little greater in this Micmac skull, as the missing section of the cranial roof would slightly reduce the measurement. In any case this cranial measurement (see Fig. 11) clearly was almost exactly the same as in the modern European type of skull.

The Capacity of the Cranium.—This could not be estimated in the usual way owing to the large gap in the right half of the cranial roof, previously referred to. A sagittal section of the skull was therefore made just to the left of the mesial plane in order to preserve the nasal septum. The gap was then closed from the inside by plaster and the cubic capacity of each half of the cranium estimated by filling it with sand the foramen magnum being meanwhile closed up to the level of the sagittal section. The capacity of the left half was 690 cu. cm. That of the right half was of course rather larger and

proved to be 805 cu. cm. The total cranial capacity was thus estimated to be approximately 1495 cu. cm. This was slightly above the average for 73 male Scottish skulls, estimated by Turner to be 1478 cu. cm. Still it should be mentioned that 33 of these had a capacity of over 1500 cu. cm.

The Cranial Length.—The most posterior point of the skull as shown in Fig. 7 was found to be about midway between the lambda and the inion. The measurement from the glabella to this proved to be 182.5 mm. The distance from the glabella to the inion was 9 mm. less, namely 173.5 mm. These measurements were less than the mean of 117 male Scottish skulls which was found by Turner [6] to be 186.6 mm. Contrast this, further, with the mean glabella-inion length of 100 aboriginal Australian skulls, which was found by Berry and Robertson [8] to be 179.5 mm., (unsexed) and the mean glabella-inion length of 44 aboriginal Tasmanian skulls [9] which was found by the same two observers to be 173.1 mm. It is also significant to contrast this cranial length with 190 and 199 m m. which were the measurements found by the author in two markedly dolichocephalic New Hebridean skulls.

The Maximum Cranial Breadth.—This measurement proved to be 147.5 mm., which was just below the average for 114 male Scottish skulls[6], but was much greater than the mean maximum breath of 100 Australian skulls which was 130.7 mm., (unsexed) according to Berry and Robertson, [10] and also much greater than the maximum breath of two Melanesian skulls recently recorded by the writer [7]—122 and 128 mm.

The Cephalic Index.— This was calculated to be 80.8, a result which practically accorded with the figure estimated by Mr. H. Piers, the Curator of the Nova Scotia Provincial Museum, and noted by him on the descriptive label attached to the skull. The cranium was thus definitely brachycephalic,

which I was always taught to accept as the prevailing type of skull amongst North American Indians. However, Hrdlicka's [4] recent work on the crania of the Eastern Indian tribes of the United States has quite dispelled that idea, for he found that only 10.9% of the male skulls of his series showed a brachycephalic condition. Still there is no doubt that the broad headed type according to Hrdlicka's map[4] was fairly prevalent amongst the more Western Indian tribes, which merged southward into the high indices of the ancient Incas of Peru, and westward across the Pacific into the comparatively broad headed Polynesians and Mongolians. On investigating this question in the case of other aboriginal inhabitants of the Western Hemisphere, I was much struck by the remarkably broad headed character of the wonderful Muniz collection of ancient Inca skulls. [1] In Fig. 1. I prepared outlines of two[1] of these (Crania Nos. 15 and 18) examined from above, for comparison with the Micmac skull (which is shown in the middle of the Fig.). All these were drawn to exactly the same scale, so as to make the degree of resembance still more striking. This result is all the more significant when compared with the average British cephalic index which is 76, thus placing it in the sub-dolichocephalic class of Broca [7] Again, it is possible that the Beothuck aboriginal Indians of Newfoundland [1] were genetically related to the Micmacs in some way, and in reference to this point it is of interest to note that Mr. Prest [15] found the cephalic indices of two aboriginal Beothuck Indian skulls in the Museum, St. Johns, Newfoundland to be 78.45 and 80.2, both of which were comparatively high. It is a well known fact that there was a considerable intermingling of French Acadian and Micmac blood, so that the high cephalic index of this Micmac cranium may be of some help there, as the predominant type of skull in France, in the British Isles, and in extreme

1) None of these exhibited the artificial deformity frequently seen in the Inca skull. I wish to express my grateful thanks to Dr. J. W. Fewkes, Chief of the Bureau of American Ethnology for permission to publish outline tracings of these two crania from the sixteenth Annual Report of the Bureau of American Ethnology, 1894-1895

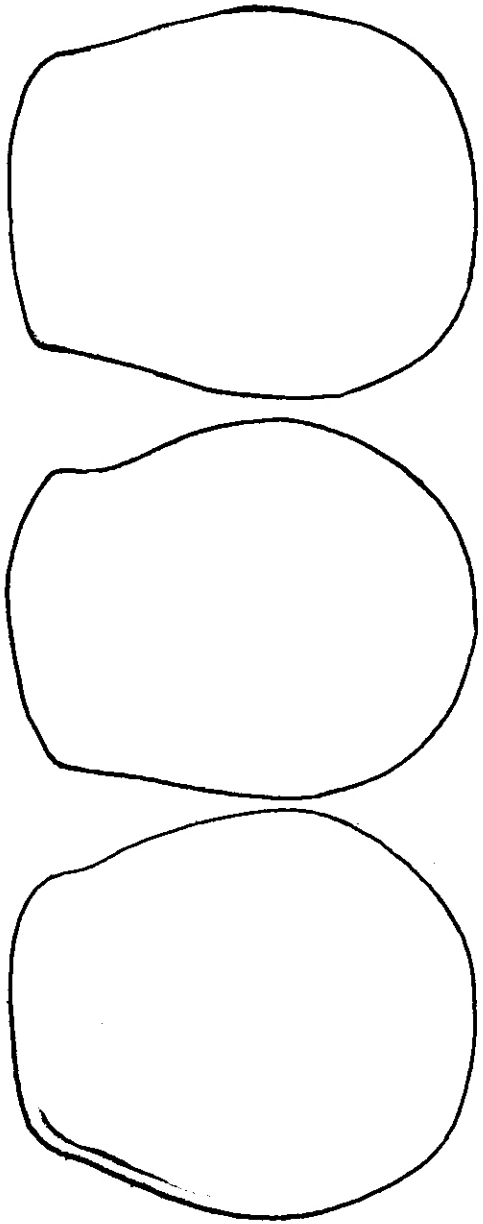

Fig 1. Exhibits the outlines of three crania seen from above. That in the middle represents the Micmac specimen, while the others are outlines of Crania Nos. 15 and 18 from the Muniz collection of ancient Inca skulls, copied by the kind permission of Dr. J. W. Fewkes, from the 16th Annual Report of the Bureau of American Ethnology. The three are drawn to the same scale. It will be observed that all three are brachycephalic and exhibit a certain degree of similarity of cranial outline.

Western Europe generally is mesaticephalic. Before leaving the discussion of the cephalic index, it is however, just as well to repeat a note of warning I have given in previous papers, and it is this, that the same race may show examples of the extreme limits of variation of this index. For example Turner [6] found brachycephaly in 35 out of 174 Scottish skulls Therefore though one found a single Micmac skull with a marked degree of brachycephaly, one could not make the assertion that the whole tribe was brachycephalic. Hence my appeal for further material in order to ascertain the racial range of variation of this index. It may be mentioned here that the cephalic index and the configuration of this Micmac cranium closely correspond to those of the "Burlington County skull" described by Hrdlicka.[23]

The Index of Cranial Height.—This was found to be 73.09, thus placing the skull in the metriocephalic class. This figure is in striking contrast to 65.5 and 68.1 which were the indices of cranial height recently recorded by the writer in two Melanseian skulls, [7] thus locating these skulls at the lowest limit of the tapeinocephalic class. It may be noted in passing that the index of cranial height for the British type of skull is 71, [3] which locates it at the upper end of the tapeinocephalic group.

The Breadth-Height Index.—This cranial index has been very little exploited, but I am glad to find that an authority like Turner [6] advocated its use very strongly. In this Micmac skull the index proved to be 90.5, this rendering it platychamaecephalic. This latter title was suggested by Turner[6], who pointed out that in brachycephalic skulls the breadth was usually greater than the height, and that certainly proved to be the condition in this instance. The height according to the index was of course 90.5% of the breadth.

The Nasal Index.—The nasal bones and the septum were markedly deflected to the right, evidently due to some acci-

dent during life. However, this apparently did not occur at the time of the accident which caused the death of the individual as the bones showed no recent fracture, nor even signs of osseous thickening that would indicate an injury even more remote. This distortion of the nasal bones did not effect the nasal index in any way. The nasal width was found to be exactly half the nasal height, the index thus being 50, and placing the skull in the mesorrhine group. Compare this with the index of 54.9 recorded by the author in a Melanesian skull [7] which was thus markedly platyrrhine, and indicated a very wide nasal aperture, which is, of course, the condition in all the lower races of modern mankind. The nasal index of the Micmac skull proved to be the same as that of the Mongolian type of skull, which is given by Flower [3] as averaging 50, and it is further of interest to note that this figure is intermediate between the lowest types and the British type of skull where the average index was found by the same observer to be 46 (leptorrhine).

The Alveolar or Gnathic Index.—The basi-nasal and the basi-alveolar lengths proved to be exactly the same, namely 104 mm., so that the alveolar index was obviously 100, thus placing the skull in the middle of the mesognathous class [3] (Flower) [3]. The projection of the jaws proved however, to be almost entirely of the subnasal variety which corresponds to the condition met with in the Andamanese skull [11]. The upper part of the face certainly looked definitely orthognathous. The most significant fact regarding this index was that it practically corresponded to the figure for the average Mongolian type of skull, thus providing one more feature of affinity between the North American Indian and the Mongolian.

The Stephano-Zygomatic Index.—This index was calculated as 83.3, the result being that the zygomatic arches were tolerably well exposed when the skull was viewed from above,

thus placing it in the phaenozygous group. It was, however, not nearly as phaenozygous as the two Melanesian skulls recently described by the writer, where the figures were 73 and 71, and represented the lowest ebb for this index. The average stephano-zygomatic index for the European male is just over 90[3], so that this Micmac skull, so far as this index was concerned, occupied a remarkably intermediate position between the highest and the lowest types of modern Hominidae.

The Orbital Index.—This is admittedly a rather variable cranial index, but it exhibits some consistent features. For example, it is persistently high in all the Mongoloid races. It is therefore not surprising to find that this Micmac skull, whose cranial indices have been already shown to possess some close Mongolian affinities, should exhibit an orbital index of 88.04, thus placing it at the highest limit of the mesosemic group. In order to lend further emphasis to this point it is of value to contrast the above figure with 80 and 81 which were the orbital indices recently recorded by the writer in two Melanesian skulls[8]. In the memoir dealing with these and also in another paper[7] I discussed the influence which the degree of development of the frontal and maxillary air sinuses exerts upon the orbital contour, so that it will not be necessary to dilate further upon this topic. It is however, important to point out that the height of the orbital aperture is greater in all the Mongoloid races than in the European, and this fact of course accounts for the high degree of index yielded by these. It is therefore strange that as regards this index the European skull occupies a position intermediate between the Mongoloid and the lowest races of modern Hominidae.

The Maxillo-Facial Index. Broad headed races are also broad faced as a rule, though this is by no means infallible. The index in this skull proved to be 47.03, so that it followed the above rule consistently and was brachyfacial or chamae-

prosopic, the index in this case conveying the information that the facial breadth was slightly more than twice the facial height.

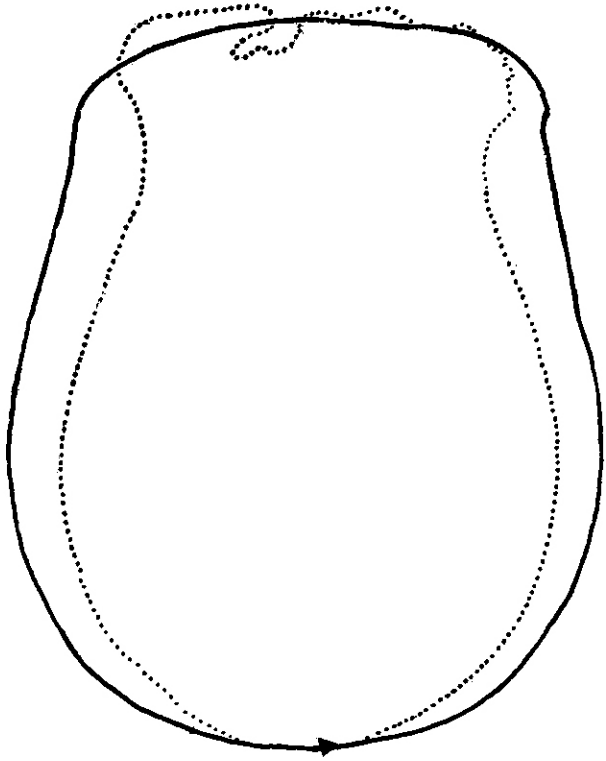

Fig 2. shows the superiority of the Micmac skull when compared with the outline of the Java calvaria (shown in dotted outline). Both crania are drawn to the same scale, which intensifies the marked post-orbital constriction of the Java specimen. Note further how the heavy gorilla-like supraorbital ridges of the Java calvaria project beyond the well modelled frontal contour of the Micmac skull.

The Fronto-Parietal Index.—This cranial index has been much exploited during recent years in relation to the study of the calvaria of fossil man, and has proved itself to be a valuable addition to modern craniometrical methods. In order to

introduce the subject of this index it is useful to mention first of all that the minimum post-orbital diameter of the Java calvaria ([18]) (Pithecanthropus erectus) is only 87 mm. The fronto-parietal index for Pithecanthropus was found to be 65.4, which meant of course that the minimum post-orbital

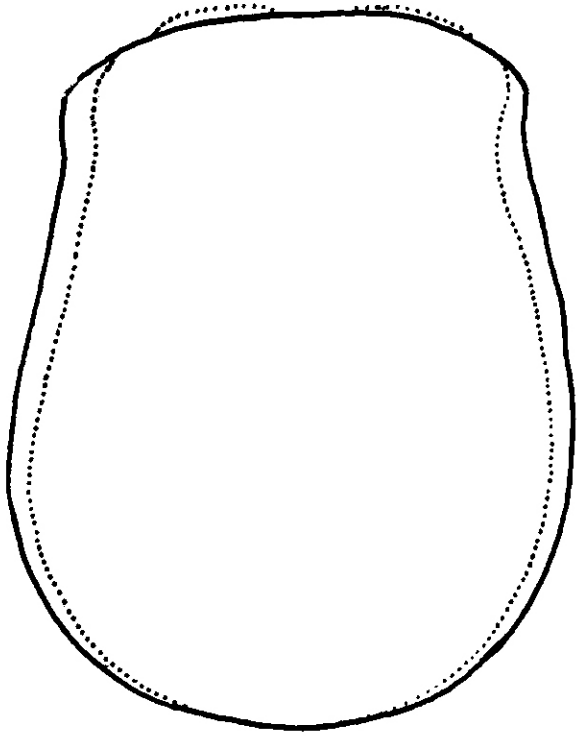

Fig 3 demonstrates the fact that the Micmac skull was better filled than the Neanderthal calvaria, especially in the region of the post-orbital constriction. The Neanderthal specimen is shown in dotted outline and both crania are drawn to the same scale. Note how the prominent Neanderthal supraorbital ridges project beyond the Micmac frontal contour.

diameter was 65.4% of the maximum parietal width. The fronto-parietal index in this Micmac skull was calculated to be 71.5 which compared unfavourably even with that of a Melanesian skull, recently recorded by the author as 72.6.[7] This detrimental comparison was partly explained by the fact that the maximum parietal width of the Melanesian skull was very low, namely 128 mm. This remarkable post-orbital constriction imparts a characteristic outline to the Java calvaria, as well as to the crania of the anthropoid apes, when studied from above. Fig. 2 shows the Java calvaria (in dotted outline) and the outline of the Micmac skull drawn to the same scale and seen from above. The minimum post-orbital diameter was 87 mm., in the Java skull, and 105.5 mm., in this Micmac skull, while the maximum parietal breadths were 133 and 147.5 mm., respectively. This Micmac skull thus exhibited a considerable degree of filling out of the general cranial contour, and more particularly a laudable attempt to obliterate the post-orbital constriction. In Fig. 2 this latter effect is seen to be in marked contrast to the retraction of the Micmac frontal contour on each side of the mesial plane, the evolutionary scheme underlying this, no doubt, being to remove as much trace as possible of the heavy gorilla-like supraorbital arches of the Java calvaria. Fig. 3 which exhibits outlines of this Micmac skull and the Neanderthal calvaria (in dotted outline) drawn to the same scale, will be found to present several points of interest. Note in the first place the superiority of this Micmac frontal contour, as compared with the projecting supraorbital ridges of the Neanderthal specimen. The minimum post-frontal diameter and the maximum parietal breadth of the Neanderthal calvaria [17] were 107 and 147 mm., respectively, which it may be noted were practically the same as those of this Micmac skull, but the Neanderthal calvaria was 199 mm., in maximum length, so that when reduced to the same scale, the relative superiority of this Micmac skull in all its transverse dimensions was at once apparent.

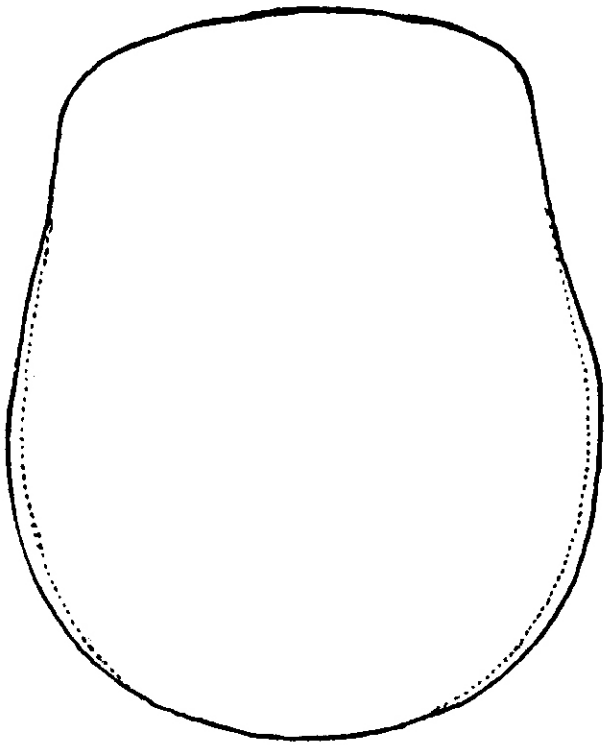

Fig. 4 exhibits outlines of the Micmac and the Piltdown crania (Smith Woodward's first reconstruction), viewed from above and drawn to the same scale. The Piltdown specimen is shown in dotted outline. The superiority of the transverse dimensions of the Micmac skull is only relative, owing to its being shorter than the Piltdown cranium. The frontal contours of both skulls are seen to coincide exactly.

As shown in Fig. 4, the frontal contour of the Micmac skull, when drawn to the same scale, was found to coincide with that of the Piltdown skull [20] (Smith Woodward's first reconstruction).[1] Otherwise the slight relative superiority of this Micmac skull is at once apparent, though the post-orbital

(1) The writer understands that Smith Woodward has prepared a second reconstruction which exhibits a greater cranial capacity than the first. I have so far had no opportunity to examine this second model.

diameter and the maximum parietal breadth were actually slightly greater in the Piltdown specimen (112 m m., and 150 m m., respectively). The maximum Piltdown cranial length was, however, 190 m m., as compared with 182.5 mm., which of course detracted slightly from the breadth when both crania were drawn to the same scale.

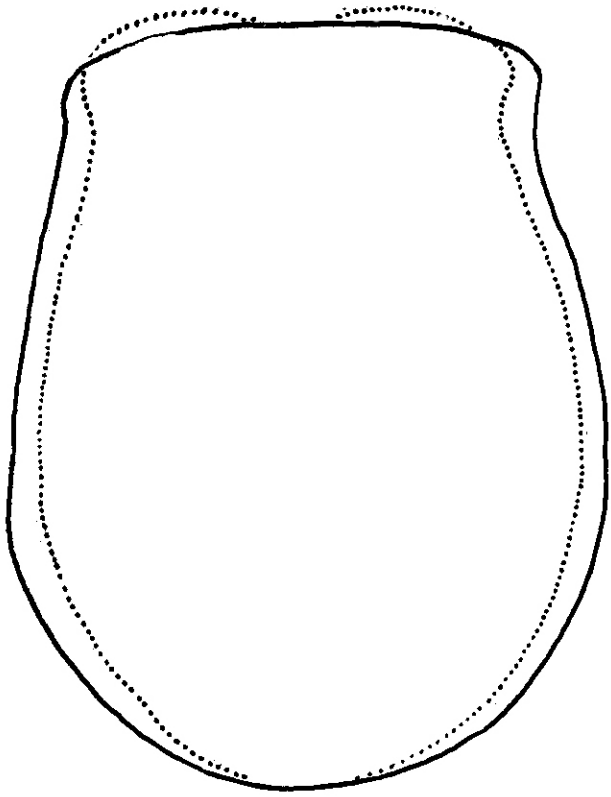

Fig. 5 exhibits outlines of the Micmac skull and a Melanesian skull, drawn to the same scale and viewed from above. The Melanesian cranial contour is represented in dotted outline and is seen to be comparatively deficient in all its transverse dimensions, but particularly so in the region of the post-orbital constriction. Indeed it compares unfavourably to a slight degree even with the Neanderthal calvaria (Fig. 3) and in common with that, exhibits the prominent supraorbital ridges which project well beyond the line of the Micmac frontal contour.

Fig. 5 is an outline of a Melanesian skull (in dotted outline) drawn to the same scale as the Micmac skull which will be observed to exhibit the superiotity of its transverse dimensions in every way. Note for example its smooth rounded frontal contour as compared with the heavy supraorbital projections of the Melanesian skull. Observe again how poorly filled is the Melanesian skull, particularly in the region of the post-orbital constriction. In fact it will be noted on comparing this with Fig. 3 that the contour of the Melanesian skull shows a grade actually inferior to that of the Neanderthal skull, and might indeed almost be regarded as a half way stage back to the Java type. (See Fig. 2).

The Calvarial Height Index.—The calvarial height was 98.5 mm., which yielded a calvarial height index of 56.7. This was practically the same as the average index for two Melansian skulls recently recorded by the writer in Vol. XIV of these Transactions, [7] but is distinctly better than the average of 100 Aboriginal Australian skulls (unsexed) which was recently given by Berry & Robertson [01] as 53, though inferior to the average of 32 European skulls which was given by the same two observers as 59.8.[10] The salient point to be noted, however, was that the figure was well within the range of variation for even the European type of skull (54.4 to 66.2). It may be noted in passing that this index exhibits a marked improvement when compared with those of the Java calvaria (34. 2), the Neanderthal calvaria (40.2), the Piltdown skull (47.3)[1] and the Cro-magnon skull (50).

The Bregmatic Angle.—This angle was ascertained to be 60° (See Figs. 6 and 7) which is certainly within the range of variation for the higher races of modern Hominidae. In fact I find from tables of comparison of this angle, furnished by Berry & Robertson, [19] that it was almost exactly the same as the mean average for forty European skulls, namely

(1) This was calculated by the writer from the list of cranial measurements by Smith Woodward of his first reconstruction of the Piltdown cranium.

59.9°, the minimum of this series being 54° and the maximum

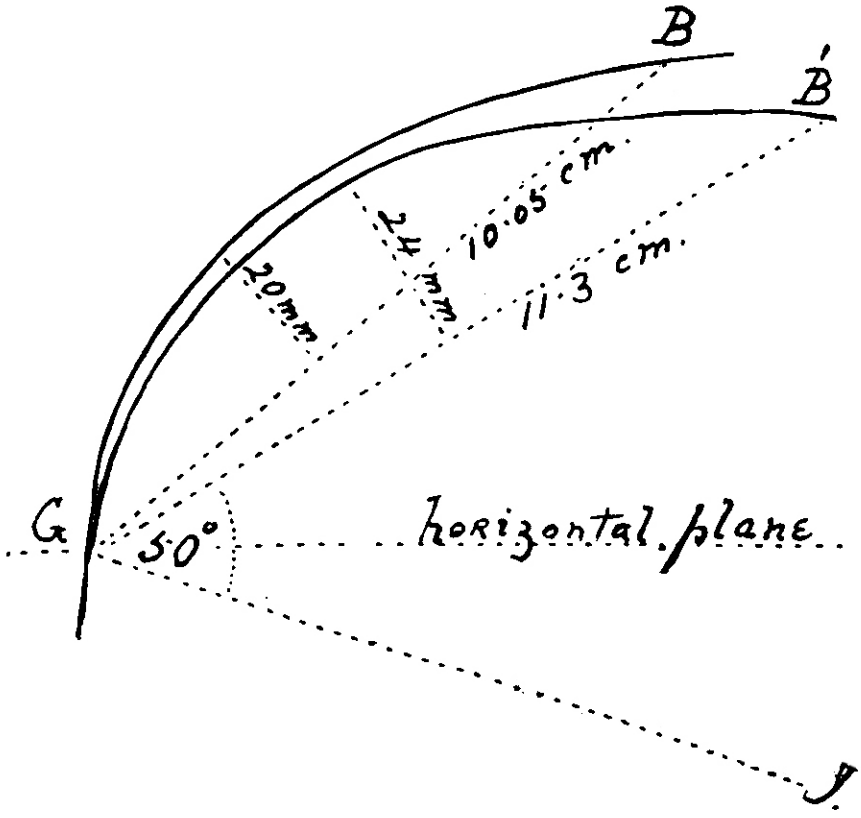

Fig. 6 has been devised for the purpose of comparing the frontal contour, the glabella-bregma chord and the bregmatic angle (BGI) of the Piltdown cranium (Smith Woodward's first reconstruction) with those of the Micmac skull. It will be noted that though the Piltdown bregmatic angle (50°) is smaller, yet its frontal cranial curvature shows a greater superiority and thus does not fall much short of the Micmac cranial outline. GB & GI represent the glabella-bregma and glabella-inion lines respectively.

68°. The angle in this Micmac skull was greater than that recently recorded by the writer [7] in two New Hebrides Melanesian skulls (55° and 59°) and exhibited a pronounced superiority over those of the Java calvaria (37.5°) and the

fossil hominidae such as for example Neanderthal man (44°), Piltdown man (50°) and the Cro-magnon man (54°). Fig 6 has been devised for the purpose of comparing the bregmatic angle in the Micmac and the Piltdown crania. This angle it may be noted is included between the glabella-bregma (G. B.) and the glabella-inion (G. I.) lines. The frontal curves of both skulls are exhibited in the mesial plane in the Fig., and it will be noted how effectively an increase in the size of this angle (in this case from 50° to 60°) raises the cranial roof during the evolutionary process, and thereby of course substantially increases its capacity.

The Cranial Chords and Curvatures.

The Glabella-bregma chord which measured 100.5 mm., was comparatively short when compared with that of the average European skull, which was given by Berry & Robertson, [10] as 112.5 mm., (the average of five). This low figure probably was explained partly at least by the fact that this Micmac skull as a whole was comparatively shorter than the average European type, and this would tend to shorten the individual cranial chords and curvatures (Fig. 7). It was even below the minimum range of variation for the European type which was 109 mm. The maximum distance of the frontal cranial arc from the frontal chord was at a point 37.5 mm. from the glabella and measured 20 mm. This was less than the average for the Canadian skull, which I found to be about 24 mm., and was less even than the distance in the Piltdown skull which was supposed to be 24 mm., as Fig. 6 shows. It is thus clear that any slight increase of this distance assists greatly in the "uplifting" of the frontal cranial arc. For example, in Fig. 6 it will be noted that, though the bregmatic angle is much less in the Piltdown skull, the enhanced distance between the chord and arc brings it up very nearly to the outline of the Micmac skull.

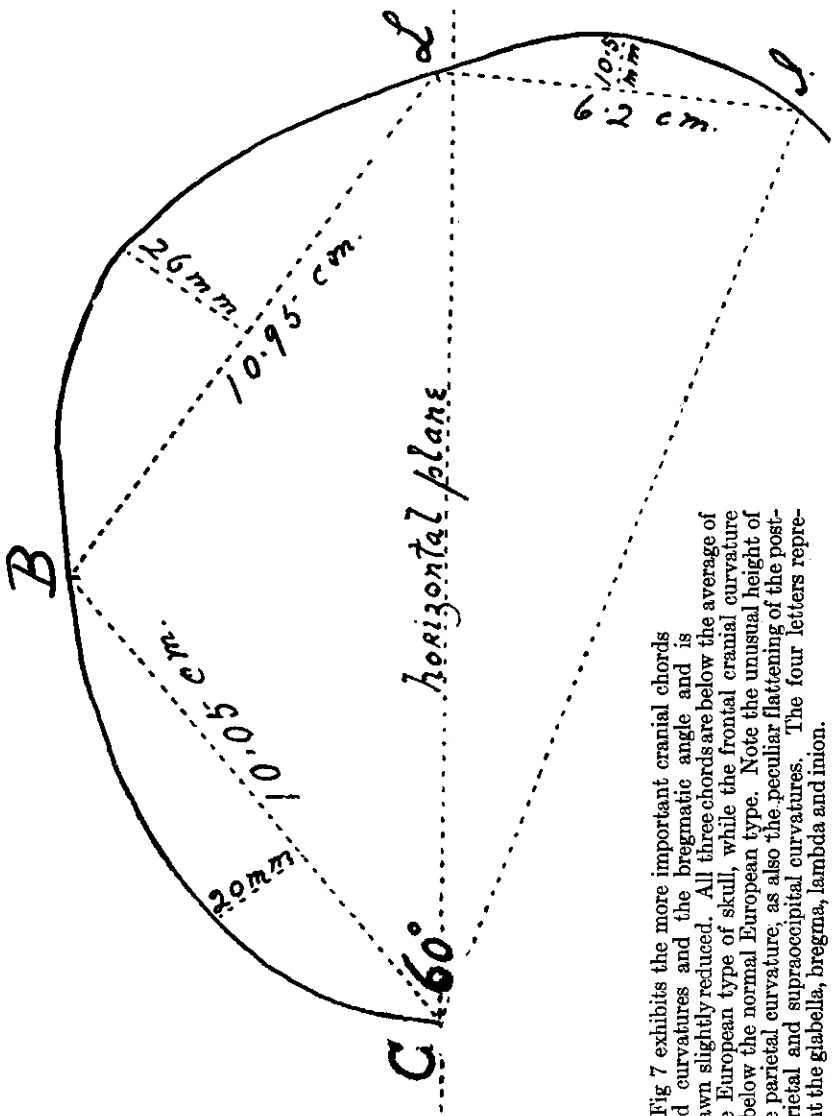

Fig 7 exhibits the more important cranial chords and curvatures and the bregmatic angle and is drawn slightly reduced. All three chords are below the average of the European type of skull, while the frontal cranial curvature is below the normal European type. Note the unusual height of the parietal curvature, as also the peculiar flattening of the post-parietal and supraoccipital curvatures. The four letters represent the glabella, bregma, lambda and inion.

The Bregma-Lambda Chord measured 109.5 mm., which was likewise below the European average of 112 mm., given by Büchner.[21] The maximum distance of the parietal cranial arc from the chord was at a point 52.5 mm., from the bregma and measured 26 mm., which was slightly above the European average [21] of 24 mm. The post-parietal and supra-occipital areas of the cranial curvature were rather flattened as exhibited in Figs. 7 and 12.

The lambda-Inion Chord was found to be 62 mm., which was just below the European average of 63 mm., as given by Büchner.[21] The maximum distance of the lambda-inion cranial arc from the chord was at about its centre and measured 10.5 mm., which was practically the same as the European average of 11 mm.[21]

The Inter-Malar Breadth.—This amounted to 119 mm., and was therefore less than the interzygomatic breadth. This dimension proved to be practically the same as the average intermalar breadth in Turner's [6] extensive series of Scottish skulls.

The Antero-Posterior Diameter of the Foramen magnum was 36 mm. This was practically the same as the average for 7 male Munsee North American Indian Crania which was found by Hrdlicka [4] to be 35 mm., and likewise approximated to the average dimensions of this opening in a series of Scottish skulls,[6] which when calculated from Turner's tables proved to be 35.3 mm. The relative size of the Foramen Magnum in various races does not appear to yield any definite factor of anthropological significance.

The Palato-Maxillary Index.—The palato-maxillary breadth was 64.5 mm. and the length 57.5 mm., so that the palato-maxillary index proved to be 112.1, thus classing the skull as mesuranic. This result may be compared to 115.4 which was obtained in a Melanesian skull,[7] thus placing it in the brachyuranic class. This index does not appear to possess any inter-

racial significance for the extreme limits of its fluctuations were found by Turner [6] to be present in his extensive series of Scottish skulls. For example, 19 of these crania showed indices above 120, and 11 possessed indices below 105.

The Dental Index.—All the teeth had dropped out of their sockets, but it is evident that all were present at death for the alveoli were deep and showed a healthy condition of the bone, though the fragile tissue of their front walls had been broken away here and there. The sockets for the molar and premolar series were very clearly defined, so that by measuring from the front edge of the first premolar socket to the posterior edge of the third molar socket an approximate idea of the dental index could be obtained. It worked out at 45.6, thus placing the skull in the megadont class, and rendering the dentition comparable to that of the lowest types of modern Hominidae. However, one meets occasionally with anomalies of this nature in single specimens of skulls. For example I found that the dentition was microdont in two New Hebridian skulls [7] of the Melanesian type, where one would have expected a definite megadont condition. One cannot therefore rely on a small series of skulls, far less on any single specimen owing to the vagaries of the racial range of variation, which vitiates the value of all individual cranial indices and measurements.

The Spheno-Maxillary Angle.—I have usually found this to be a trustworthy cranial angular measurement, and I am bound to say that it provided a surprise in this skull, for it proved to be as much as 95° which was as great as in the two Melanesian skulls recently described by the author.[7] The angle is usually much smaller than this in the orthognathous skull of the higher races of mankind, and generally measures about 75° in Europeans. One would have expected to have found the spheno-maxillary angle in the North American Indian about midway in size between the highest and the

lowest races of modern Hominidae, instead of being comparable to that of such a low type as the Melanesian. However, as this Micmac skull is a single specimen, I will not rest satisfied until I have been able to estimate the size of this very important angle in numerous examples of North American Indian skulls. (Fig. 8).

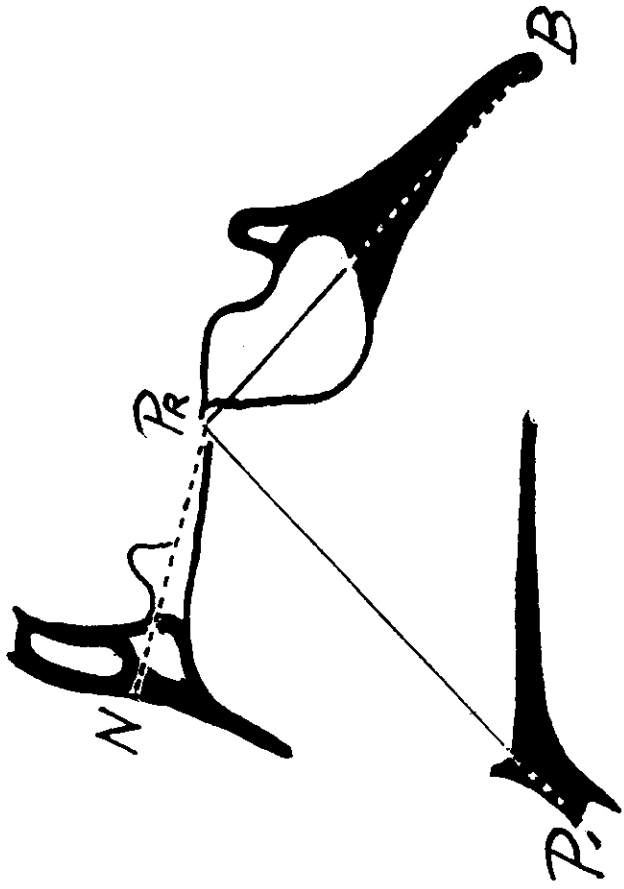

Fig 8 is a tracing of the basal portion of the Micmac skull in order to demonstrate the important spheno-maxillary (P. Pr. B.) and spheno-ethmoidal (N. Pr. B) angles, which in this specimen are both decidedly more Simian than the average in the European type of skull and conform to the size found in the aboriginal Australian and Melanesian types of cranium. The letters P. N. Pr. and B. represent the prosthion, nasion, Prosphenion and basion respectively.

The Spheno-Ethmoidal angle.—This angular measurement provided even a greater surprise than the previous one for it was ascertained to be as high as 157°, which compared unfavourably even with such low cranial types as the Aboriginal Australian ([11]) (153°) and the Melanesian ([7]) (151°). This

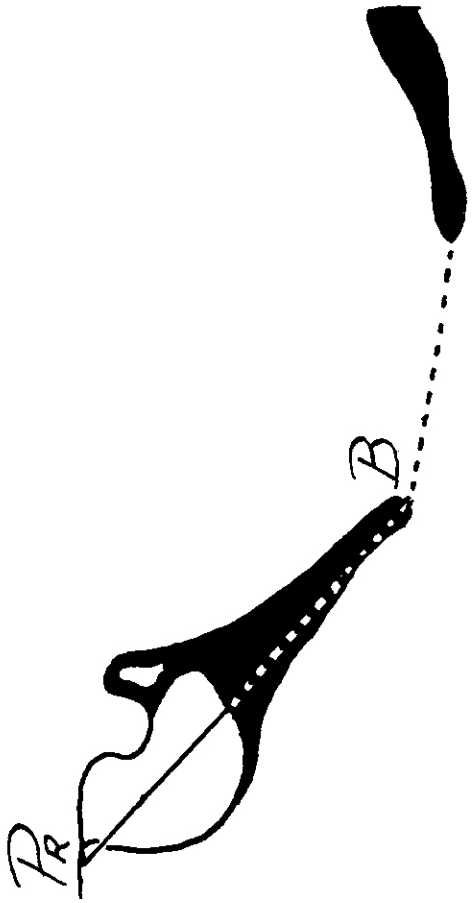

Fig. 9 shows the foramino-basal angle of the Micmac cranium which proved to be slightly more Simian than the average European type of angle and like the spheno-maxillary and spheno-ethmoidal angles was practically the same size as in aboriginal Australian and Melansian types of skull.

angle was found to be 138° by Duckworth([11]) as, the average of two European skulls, so that the difference in its size amongst the highest and the lowest races of modern mankind was

very considerable. It may be mentioned that this angle approximates to 180 in the anthropoid ape, and gradually diminishes in size as one ascends the evolutionary scale. (Fig. 8).

The Foramino-Basal Angle.—This angular measurement consistently followed the previous two, and was found to be 146° which was exactly the same as in the lowly evolved aboriginal Australian [11] and the Melanesian. [7] This angle gradually increases in size as one ascends the evolutionary stem and measures 149° in the European cranium [11] These three angular measurements clearly place this Micmac skull at a considerable distance from the European type of skull, and indeed, in a rather unfavourable inter-racial position; and I am therefore all the more eager to secure an early opportunity of ascertaining their condition in a whole series of North American Indian skulls. (Fig. 9).

Special Study of the Facial Skeleton.

The author made a special study of the facial portion of the skull in the following way. Horizontal lines were drawn through the nasion, the lower borders of the orbits, the akanthion, and the prosthion respectively. These divided the face into upper, middle and lower horizontal areas. On studying the relative proportions of these it was observed that the middle and lower areas were approximately equal in depth while the uppermost was distinctly more extensive in its vertical dimensions than the lower two. The points through which these lines are drawn are, with the exception of the lower orbital margins, recognized as fairly constant in position, though in the case of this skull the position of the prosthion could be only approximately determined owing to slight deficiency of the alveoli of the incisor teeth. Still it was considered possible that this method of studying the *norma frontalis* of the skull might be utilized as an additional criterion for determining the race of any given skull. I have so

far not applied this method to anything like an extensive series of crania, and am therefore unable at present to make any definite pronouncement as to its value or otherwise. How-

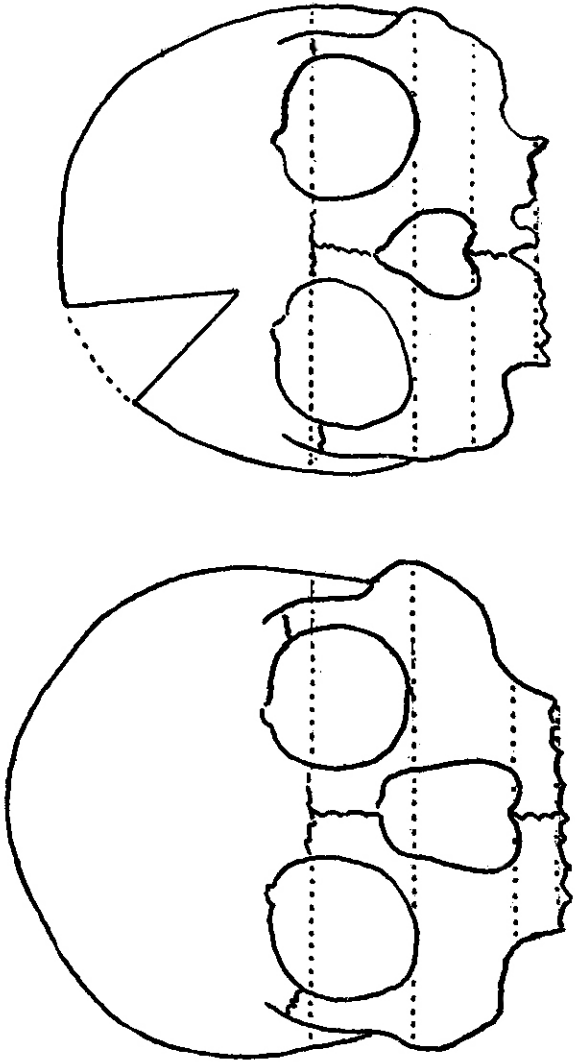

Fig. 10 is a comparative study of the facial portions of the Micmac skull (on the right) and of a Melanesian skull (on the left). These are not drawn to the same scale. Horizontal lines are drawn through the nasion, lower orbital margins, the akanthion and the prosthion. The relative proportions of the three horizontal areas, thus mapped out are shown to be totally different in the two cases. For example in the Micmac skull the two lower areas are almost equal in vertical depth, while the uppermost one is more extensive than either of these. In the Melanesian cranium, on the other hand the two upper areas are approximately equal in vertical depth, while the lowermost possesses only about half the vertical dimensions of either of the upper two. It is suggested that this method may prove to be a useful addition to the craniometric study of the *norma frontalis* of the skull.

ever, I found that the three horizontal areas in the Melanesian skull exhibited a very decided degree of difference from those of this Micmac skull in regard to their relative proportions. Fig. 10 has been designed to demonstrate this comparative difference. The Micmac skull (which is to the right) is an outline sketch of the photograph shown in Fig. 11 and is not drawn to the same scale as the Melanesian skull (exhibited on the left). In the latter, the lower horizontal area shows a marked reduction in depth when compared with the Micmac skull, and is due of course to pronounced foreshortening, the result of an excessive degree of prognathism in this case (an alveolar index of 106.7). On examining the two upper horizontal areas in the Melanesian skull it is at once observed that they are almost exactly equal in depth. (Fig. 10).

It is evident, then, that this method disclosed a very profound inter-racial difference, so far as these two individual skulls were concerned. Indeed, the results look so hopeful and encouraging that I intend to apply this method to an extensive series of skulls, when the opportunity arises, and would cordially invite others who are interested in craniology to do likewise.

The writer cannot conclude this paper without expressing his cordial thanks to Dr. J. W. Fewkes, Chief of the Bureau of American Ethnology, and also to Dr. E. Sapir, Head of the Division of Anthropology, Geological Survey of Canada, for valuable contributions of literature, and also for numerous references to the bibliography relating to the Physical Anthropology of the North American Indian. The completion of this memoir would have been rendered impossible without the valuable help of these two gentlemen, which is hereby gratefully acknowledged by the author.

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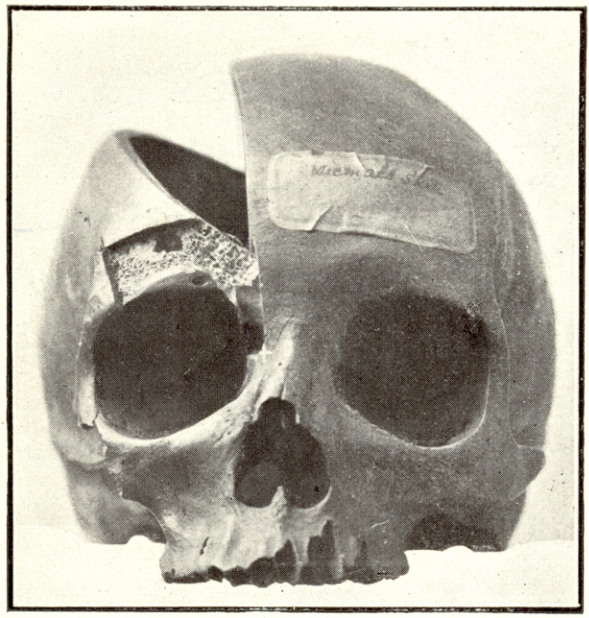

Fig. 11. Front view of the Micmac Skull. *Norma frontalis.*

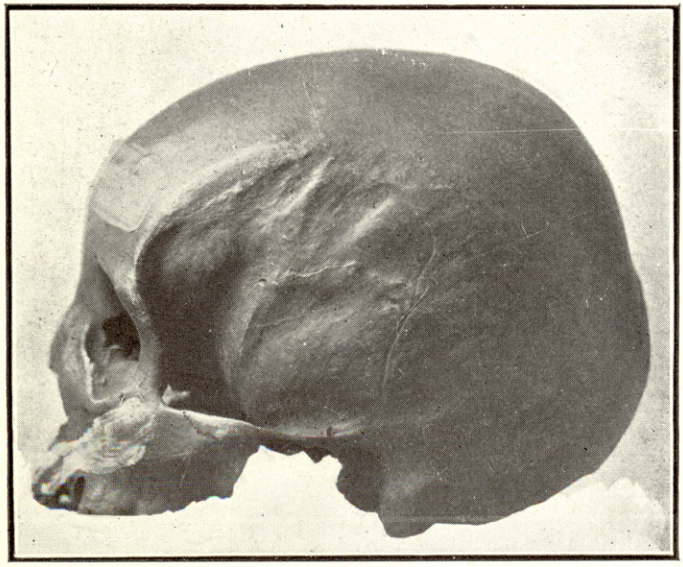

Fig. 12. Lateral view of the Micmac Skull. *Norma lateralis.*

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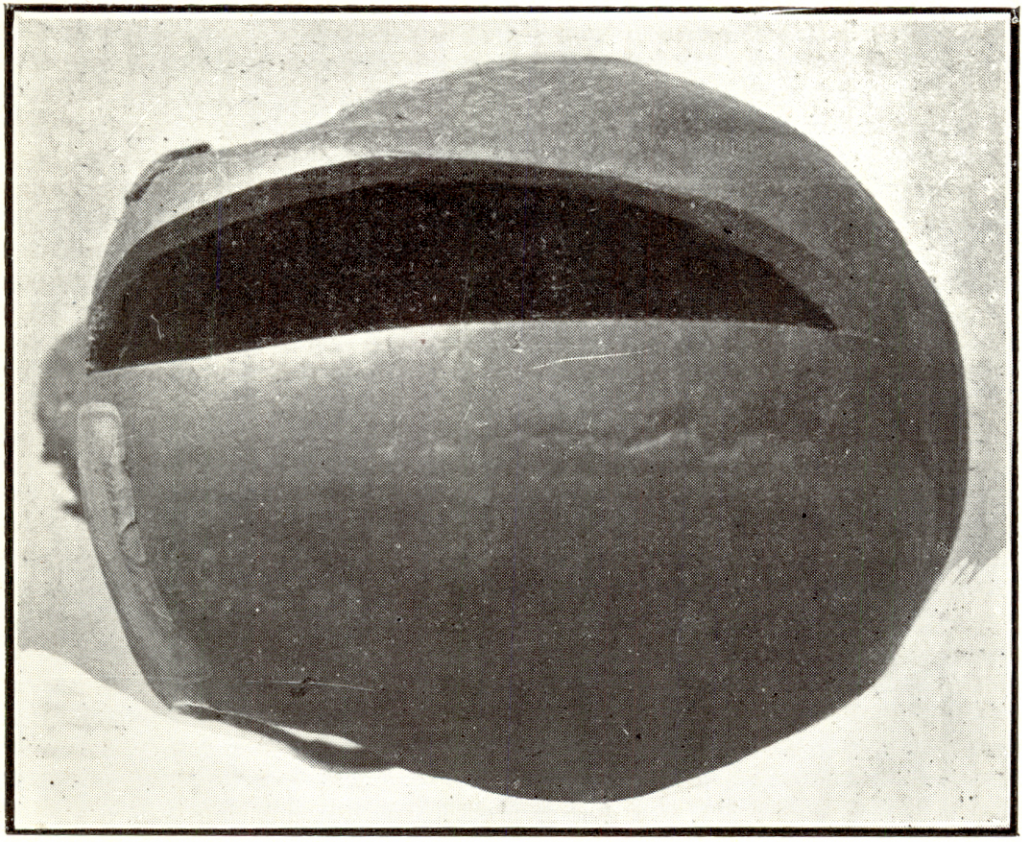

Fig. 13. The Micmac Skull viewed from above. *Norma verticalis.*

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