PAPER VIII.—ON THE MEASUREMENT OF HEADS IN ETHNOLOGICAL INVESTIGATIONS.

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THE subject of the present paper was brought before the Society, in a verbal communication, about a year ago; but I think it may be of sufficient importance to those who are engaged in ethnological investigations, based upon the forms of skulls, to place it in a more formal shape before you.

That the different races of mankind are distinguished by peculiar forms of skull, speaking generally, and with a large allowance for individual varieties, has long been admitted; and some comprehensive terms of classification have been adopted--as brachycephalic, dolichocephalic and cymbocephalic—which mark with sufficient accuracy the most conspicious variations of type which present themselves. But no man can have examined a considerable collection of skulls of the same race, without being struck with the great varieties of shape exhibited by different individuals; and though the prevailing type may be brachycephalic or dolichocephalic, yet the deviations from it will be so great, in particular instances, that an ordinary observer would be apt to think that no such decided distinctions as are made by the ethnologists can be maintained. An educated eye, indeed, will still see indications which will generally enable him to classify his specimens; and the averages of a large number of measurements will shew a tendency to conform to a particular type. But even the professed ethnologists, when generalizing from a large number of specimens, and with the aid of accurate measurements, have arrived at singularly diverse opinions as to what the characteristics of any particular race are, and as to what races have a common organization. Morton recognizes one uniform type of American skull, from the Arctic Ocean to Cape Horn, which, according to him, differs in essential particulars from those of the inhabitants of the

old world; whilst others, who have all his specimens to appeal to, and the larger experience of subsequent collections, trace as many varieties of structure in American skulls as can be found in the crania of Europe and Asia. An impartial observer, therefore, not committed to any theory, or the inventor of any imposing terms of classification, will be apt to consider the whole subject too much in its infancy to be pronounced upon with any approach to dognatism; and though he may admit that there may be a classification of which the subject is susceptible, he may be excused if he doubts whether we have as yet hit upon the proper method of establishing it.

I make no pretensions to be an authority upon ethnology; but, having been thrown in the way of persons devoted to the study, and having read a good deal upon the subject and examined many skulls, especially of our aboriginal tribes, I confess that this was about the conclusion I had come to, when the circumstance occured which gave rise to the investigation which forms the subject of the present paper. You will recollect that my friend Dr, Daniel Wilson, of Toronto, the author of Prehistoric Man, and a great authority upon skulls, was asked, in passing through Quebec on his road to England, to deliver a lecture at a Conversazione with which we concluded the Session of 1863. The subject which he selected was "Artificial cranial distortions as illustrative of Ethnology." A few days before he arrived, my friend, the Rev. James Douglas, going to be measured for a hat, was much struck with the extraordinary want of symmetry in his own head, of which he shewed me the model; and we thought that we might collect from a hatter specimens of distortions in the civilized community of Quebec, which we might exhibit in connection with Dr. Wilson's lecture upon the artificial forms of the flat heads and others. With this object, I obtained from Mr. Ashworth a very large collection of models, taken by an instrument known as the "conformateur;" and a most wonderful array of extraordinary forms it certainly presented. The old terms of trachycephalic and dolichocephalic did not begin to distinguish the various com-

plicated shapes which the heads of the customers of one hatter displayed. At first sight, I was struck with astonishment; but a little consideration shewed that these unnatural deviations of the heads from a common type arose, not so much from the heads themselves as from the nature of the instrument with which the models were taken. They were a gross exaggeration of the peculiarities of each head, and the principle of the instrument necessarily made them such. For those who may not have examined one, I will give a description of a conformateur.

Its general shape is that of a lowish crowned, broad-brimmed hat, the sides being composed of parallel upright rods, working into the solid brim with springs, whilst at the top of each rod is another rod at right angles to it, all of which converge towards a centre and together form the top of the hat. These latter rods, which form the top, are all of the same length and do not quite meet in the middle; and as the whole instrument, when at rest, forms a uniform oval, about the shape of, but rather smaller than, an average head, the ends of the rods on the top form a much smaller oval—the absolute differences between the diameters of which are the same as those of the larger one, the proportionate differences being of course much greater. On the free end of each of these top rods are sharp points, which, when the whole instrument is fitted on the head, upon pressing a spring, are driven through a piece of cardboard, and the card being cut out of the holes thus formed becomes the model I am speaking of. Thus, if the rods are each 2 inches long, upon the instrument being fitted to a head, the longitudinal diameter of which is 8 inches and the transverse diameter 6 inches, the model will have the longitudinal diameter 4 inches and the transverse one 2 inches; or, if the real diameters of the head are as 4 to 3, those in the model will be as 2 to 1; and all other differences will be exaggerated in the same way. The consequence is, that distortions, which would pass unnoticed in the natural size, become at once conspicuous in the reduced model, and strange as the shapes of the models may be,

the hats which are made from them would attract no attention from their singularity. In making the hats the process is exactly reversed: the cards are pinned down upon another machine, and horizontal rods, of the same length as the top rods in the conformateur, are brought into contact with it, and there screwed down, solid uprights which rise from the end of them form the block upon which the hat is moulded. In illustration of this exaggeration I give here some specimens of heads which in the model are conspicuously different, but when enlarged from the same models, as they would be to form the block, their several peculiarities could hardly be distinguished except by very delicate measurements, if that would suffice.

The consequences of this exaggeration were very remarkable. I have said that I brought home a large collection of the cards (between three and four hundred in all), all of them with the names of their owners written on them, and I commenced looking over them with a view of selecting specimens of singular shape, or of marked distortion. But I had not gone far before I observed that there were two well-marked types into which they were divisible, and that in almost every case the one bore a French and the other an English name. The French head was of a roundish form, much shorter in the longitudinal diameter than the English one, but generally broader over the parietal region, from which it narrowed down often very suddenly, the breadth over the forehead being generally less than in the English head. The latter was much longer and much more even in its breadth, being sometimes almost as broad over the forehead as in the parietal diameter. Mr. Douglas and I therefore dealt the whole out into two packs, guiding ourselves altogether by the shapes, which, with some few exceptions which were put into a third pack as doubtful, was almost as easy as separating clubs from spades. Upon examining the packs, fully ninety per cent of the long heads bore English names, whilst, if I remember rightly, there was not a single exception to the short heads bearing French names. We thought, also, that we could distinguish amongst the British names a

sub-type, as long, but narrower, and not so square, approaching in fact more to an oval, which bore Celtic names; but the difference was not very strongly marked. The only two German names which we met with were clearly distinguished from the other two types, being as short as the French heads, but of an even oval, without that sudden falling away from the great breadth over the parietal protuberances which marks the latter so strongly. Even minor differences could be detected. I had set aside five heads as well-marked, but rather exaggerated, instances of the French type, and, upon looking at the names, four of the five bore that of a well-known French family in Quebec. I took the shape of my own sister's head, which, except in size, was the exact counterpart of my own; and I fitted the conformateur on to two brothers—the Messrs. Russell—and although they do not bear a greater resemblance to each other than is common with brothers, the heads were absolutely undistinguishable, but very different from any others in the collection. In all these cases a family resemblance in the heads could be detected, much more marked than in the general features of the face.

When Dr. Wilson arrived and had delivered his lecture, I exhibited to the Society, as you will recollect, a selection of these heads, stating the facts much as I have given them upon the present occasion; and I afterwards went over the cards again with Dr. Wilson, with the same result. Since that time I have had a few opportunities of pursuing the investigation further, and I have adopted a rough method of shewing the average of a large number of heads, such as I lay upon the table this evening, viz., by tracing the outlines of each in pencil in the same space, so that whilst the inner and outer lines give the maximun and minimun size, the broad dark line, where the pencil has frequently gone over the same ground, indicates a rude average form of the two types of English and French.

Dr. Wilson subsequently pursued the subject further, and gave the results, amongst much interesting matter, in

a paper "On the physical characteristics of the ancient and modern Celt," read before the Canadian Institute, and published in the Canadian Journal of November, 1864. He has examined, in all, upwards of eleven hundred heads, from which he thinks that he has established a recognizable distinction between the pure Anglo-Saxon, as indicated by his name, and the Celt of either Ireland, Scotland or Wales. The former he considers to be marked by an almost uniform width; whilst the latter is much the widest over the parietal protuberances, and tapers away towards the frontal regions, giving it a sort of pear shape. He states that only two out of upwards of four hundred which he had classed as of the former type bore other than pure English names; but there appear to have been a considerable number of English in the class representing the Celtic division. To a certain extent, this conclusion of Dr. Wilson's accords with the indications of a difference between the forms of heads bearing Saxon and Celtic names, which Mr. Douglas and I thought we had perceived at Quebec; but neither then, nor in some subsequent examinations of the same kind, did I meet with any such decided uniformity in the result as Dr. Wilson appears to have found in his specimens. Moreover, I should hardly have called the Celtic head "pear shaped," but rather tending to oval, the absence of squareness being its main distinction from the Saxon head. There is another point brought out by Dr. Wilson, which, if it be supported by more extensive investigation, is of considerable interest. He found that of 70 French head forms, from a Montreal hatter, classified by names, only eleven presented the peculiar form so conspicuous at Quebec. The rest were much longer, but yet not conforming either to the Anglo-Saxon or to the Celtic type. This difference, he suggests, may have arisen from the different parts of France which supplied the original settlers; and it is known that whilst those of the Quebec District came from Normandy, the Montreal District was settled principally from Brittany. The longer type of head prevalent at Montreal would, therefore, indicate the Celtic ancestry of our present population; a result,

which harmonized exactly with the leading idea of Dr. Wilson's paper—which was to maintain the dolichocephalic type of the Celtic head, against Dr. Davies and others, who consider the trachycephalic skulls found in ancient barrows to be the true form of the head of the Celtic race.

My own subsequent investigations do not upon this branch of the subject yield exactly the same result which Dr. Wilson has arrived at. I divided a large collection of shapes, procured from Montreal hatters, according to their forms, making, as before, a third pack of doubtful cases; and then I examined the names. Many were without names or the names were illegible; but of 121 clearly bearing French names, 82 differed in no respect from the ordinary French type at Quebec, whilst 38 had been classed by me as probably British, or as doubtful; and of 152 bearing British names, 144 had been classed by me as such, and only 8 were of the short French type, or doubtful. I give in the illustration the average obtained in the rough way before indicated. If a line is drawn through the middle of the dark space, where the pencil has frequently gone over the same ground, it gives an average form for the 83 Montreal French heads which cannot be distinguished from the average Quebec type; but the 38 exceptional French heads have all the characteristics of the British type. There does, therefore, appear to be a difference between the French at Montreal and at Quebec, but by no means to the same extent that Dr. Wilson found in his specimens.

The mere fact that there should still be an unsettled dispute as to the distinctive type of the Celtic skull, when we have so many opportunities of examining the point both in living subjects and in ancient remains in so many different localities, and with various amounts of intermixture in the race, is of itself sufficient to prove that the science of the craniologist has not as yet attained to that certainty in its results which would entitle it to any very great degree of confidence. May it not be, that we have not as yet followed the best method of examining and recording the differences which undoubtedly do exist between different

races, as well as between different individuals of the same race? And may not a modification of the principle of the conformateur enable us to judge better of those differences, and to present them in a tangible shape for comparison with the observations of others? It is because I believe this to be the case, that I bring the subject under your notice this evening.

Let us consider what the methods now in use are. Certain measurements are taken with callipers, or with a tape, some of which cannot be obtained in the living subject. They generally are—the longitudinal diameter, the parietal diameter, the frontal diameter, and the vertical diameter. Then there are the intermastero arch and the occipito-frontal arch, and finally the horizontal circumference. Taken together, these undoutedly give us many important data, and when accompanied with a verbal description of remarkable peculiarities, as a flattened occiput, a receding forehead, &c., and, in selected instances, with a drawing of a skull from various points of view, they form the stock-in-trade of the craniologist; but are the data precise enough to found any large induction on? I exclude altogether from consideration the drawings of particular skulls. They can only be given in rare instances—cases, in fact, selected for some noticeable peculiarity, or presented as the type of a particular class. But the object of such an investigation is to arrive at such an average type from the examination of many skulls, not to accept of the conclusions of another, which may be biassed, as we know often happens, by a preconceived theory, like Dr. Morton's uniform American form of head. Descriptions also of individual specimens, besides their necessary vagueness, must be confined to a few cases, and, without some aid from description, the measurements themselves convey no very definite information. The horizontal circumference may be the same in a round as in a long and narrow head—the occipito-frontal arch does not tell us whether there is a receding forehead or a sloping occiput, or whether the crown of the head is flat or arched. The diameters are certainly more precise in the information they

yield, for those points at least at which they are taken, but many important particulars escape notice altogether; and it would be quite possible to find, or to model, two skulls exactly the same in all the measurements, which would yet to the eye be as unlike as any of the skulls which are selected as typical of different classes. Mere measurements in different directions, even accompanied by more or less vague descriptions, useful though they may be, can never present before us the distinctive peculiarities of any irregularly formed body. You meet a father and son, or two brothers, and you at once detect the family resemblance; but if two different observers were to describe each as minutely as you will, you would not be impressed with the same likeness, not even though they should give you certain measurements—as the distance between the outer orbits of the eyes, or from the frontal suture to the point of the chin, or the arch formed by carrying a tape round from the cheekbones under the chin. The peculiar resemblances of which the family likeness comes to, would altogether escape you, if you followed such a process; and it is a family likeness which we strive to detect in the skulls of the same race, and which mere measurements will never, in my opinion, adequately present before you. You want to have before you ALL the peculiarities of shape, in order to select those which vary in different individuals, or which are common to a large number—you want in short, if you can obtain it, a section of the skull in several different directions. Now the conformateur gives you this in one direction, with this difference only, which is not without its advantage, that all the peculiarities are exaggerated. It gives, or might be made to give, the exact measurement, not in one, but in all diameters in the one plane to which it relates; but as the absolute differences are represented on a scale much smaller than life, they are very much exaggerated, and a trifling peculiarity becomes noticeable which would not be detected by any but the most precise measurement, even if this happened to be taken in a right direction. It is much upon the same principle that an engineer, in giving a section of a line of country for a rail-

way or canal, makes his elevations on a much greater scale than his horizontal plan. It is not a true picture of the face of the country; but the facts are all there, if you have the key to the exaggeration, and they are conspicuous to the key to the exaggeration, and they are conspicuous to and embankments in a way that he could hardly accomplish from an array of figures alone. So it is with many other branches of science, where a series of numbers are represented graphically upon some scale, and the eye can then detect the law which they follow, in a way which it would be very difficult to accomplish by merely studying the figures themselves. It is the same with the models produced by the conformateur. The eye at once detects a certain character, a sort of family resemblance amongst a large number of models, which it would be vain to look for in discussing long columns of figures; and if an observer can do this with his own specimens, he may very readily communicate the copies (even on a smaller scale and therefore in more exaggerated proportions than those produced by our conformateur), or he may shew an average shape by the method I have adopted, copies of which may be multiplied by photography or lithography. Such an average graphically obtained would, I feel convinced, convey much more information than the names now in use, brachycephalic, dolichocephalic, kymbocephalic, scaphocephalic, platycephalic, sphenocephalic, and a host of others as learned and as vague.

The instrument must undoubtedly be modified for scientific purposes; there should be more sections than one, and we must be sure that the scale is uniform in all the instruments used, if the results obtained by different observers are to be compared. The most desirable sections, besides the horizontal one, would be the occipito-frontal one, and one from one *meatus auditorius* to the other. With such an instrument it would be difficult to retain the principle of the conformateur, which pricks out the reduced model whilst the machine is on the head. Our instrument-makers would soon devise the most convenient form; but the one which suggests itself to me would be a solid circle or oval for the horizontal section, with a

semicircular rim fixed perpendicularly to it for the occipito-frontal section and another, sliding perpendicularly upon it, which could be moved so as to bring it in a line with the ears. In these solid rims would fit the rods, all directed to the centre of the machine, sliding in and out with springs. The fixed points, the frontal suture and occipito process for the one of the upright rims, and the orifice of the ears for the other, would not necessarily lie in the plane of the horizontal rim, so that there should be a prolongation of the two upright ones to mark those points. The machine being fitted to the head, the rods would be clamped so as to retain their position, and their ends would give the true sections of the head in the three directions. To obtain the model on the reduced scale, within each rod there might be a smaller rod, which could be driven out by a spring exactly two inches long (or any other length selected). and from the ends of those the exaggerated section could be drawn. This is only a rough idea of the kind of instrument which might be constructed, in which experience would doubtless suggest improved modifications. My object is only to advocate the principle of giving sections instead of diameters and arches, and of preventing exaggerated copies of the sections, as being much more likely to attract attention to important peculiarities.