SCIENCE

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ANTHROPOLOGICAL INVESTIGATIONS IN SCHOOLS.[1]

PHYSICAL anthropology has for its object the study of the human body and of its functions. It deals more particularly with the variation of form and function caused by varying conditions or founded on inherited peculiarities. This object is attained by dividing the human species into classes, which are treated separately. Such classes or groups may be founded on difference of race; they may be founded on difference of social status; they may be founded on difference of geographical surroundings or of age. The peculiarities of each group and their differences are brought to light by a statistical treatment of the individuals comprised in each class, and the causes of these differences are studied by comparing the various groups.

The differences between these groups are not confined to the adult age, but develop during the period of childhood and adolescence. Therefore the study of the latter forms a most important branch of anthropology. It appears that the differences between the classes are comparatively slight in the beginning, but develop during the period of growth, so that the adults of the various groups show much greater divergences than the children of the same groups. These differences in the adult stage may be brought about by earlier arrest of development in certain groups than in others, or by development in diverging directions. Differences of form are generally accompanied by differences of function.

From these general considerations we must conclude that a study of the anthropology of children is of the greatest importance for a knowledge of the conditions and laws of growth. It appears probable that the mode of growth of a city population and of a country population will be found different, as the adult forms show certain differences. The American child grows differently from the European child, for there exist differences between the adult American and the adult European. The child in New England grows differently from the child in Kentucky, as the adult forms of the two countries are not the same. We may also assume that the child growing up under favorable sanitary conditions will develop differently from the less fortunately situated child. Even where the adult forms are identical we may find differences during certain stages of development which may shed an important light upon questions referring to growth.

The problems which are touched upon here have a great importance to the teacher, because the functions of any organ and also of the whole body are closely related to its development and form. The nature of this correlation is by no means clear, but remains largely a matter of investigation. Nevertheless, its existence cannot be doubted. One of the most striking cases of this kind is the result obtained by Axel Key in his extended investigations in Sweden. He found that the liability to sickness decreases with increasing rate of growth and increases with decreasing rate of growth, so that the one may be taken as the measure of the other. We know from other sources that skill in the use of certain parts of the body cannot be attained after growth has been completed, but that it must be attained during the period of development, so that the special nature of practice has an influence upon the function and probably also upon the form of the organs in the adult individuals. Piano players and rope dancers may be mentioned as instances of this kind.

The various parts of the body do not develop at the same time. Therefore we must suppose that each has its peculiar time during which it is best adapted to being trained. For these reasons the teacher has an immediate interest in the prosecution and in the results of investigations upon the bodily development of school children.

Most researches on growth have been made from purely anthropological points of view, the relation of the investigations to school work having been brought out only lately. Quetelet's investigations in Belgium were among the first that were founded on extensive material. The subject did not receive, however, great attention, until Dr. H. P Bowditch made his classic study of the school children of Boston and vicinity. His measurements included height standing, and weight. Simultaneously Dr. Charles Roberts carried on similar investigations in England. In his work are found a considerable number of data referring to the development of the various parts of the body, some of which have been taken from Quetelet's tables. Dr. Bowditch's measurements were repeated in Milwaukee by George W. Peckham, who showed that certain important differences in the rates of growth prevail in that city and in Boston. Series of observations of less extent were made by Pagliani in Turin in 1879, by Kotelmann in Hamburg in 1877, by Daffner in the military schools of Bavaria in 1884.

Michailoff carried on an investigation on a closely allied subject in Moscow, where he studied the development of the chest, a question which was also included in Dr. Roberts's measurements. An interesting article on this work has been written by Erismann. Another investigation carried on in Kretcy, Russia, by I. A. Müller, has not been accessible to us.

Lately the superintendent of schools of Freiburg in Saxony had a series of measurements made, in order to determine the proper height of seats for scholars of various classes. The most important work of this kind, and one which claims particular attention of educationists, because it has been undertaken on a large scale and solely in the interest of schools, is the inquiry of the Royal Swedish Commission, whose work was edited by Axel Key.

All these investigations were based on statistical material, that is, on the treatment of a long series of observations, but no effort was made to follow the same individuals through a series of years. Although Vierordt claims that the former method will give just as good results as the latter, provided the number of observations is sufficiently large, it must be borne in mind that the latter method, the individual method, will give many results which the general method cannot give, and that it is the only method that will allow the education-

[1] Dr. Franz Boas in the Pedagogical Seminary for June.

ist to apply the results of the general method to practical cases. Liharzik in Vienna measured twenty children regularly from the day of their birth to their eighth year, and two hundred boys from their eighth until their fourteenth year. The first to make an investigation of this kind with special reference to school work was Dr. Wretlind, who measured the increases of children during vacations and during the term. In Denmark Dr. Vahl made semi-annual weighings of the girls at Jägerspris. He arrived at the conclusion that weighings of this kind are the only means of controlling satisfactorily the sanitary conditions of school children. The studies of R. Malling-Hansen indicate that the development depends upon climatic conditions, in so far as the winter seems to cause a retarding influence. If this is true, schools in northern countries ought to have longer summer vacations than schools in southern countries, in order to make up for the lesser growth during the cold season. An important investigation of this character has also been made in Germany by Dr. Landsberger, in Posen, who followed the growth of one hundred and four children through a period of five years.

Most of these investigations deal with the growth of the whole body; they refer only incidentally to the growth of certain parts of the body. Valuable material on this point is, however, contained in Dr. Landsberger's investigation. He found, for instance, that during school age the diameters of the head change only very slightly, while the growth of the body as a whole is very rapid. The next step to be taken in researches of this kind will be the study of the growth of individual parts of the body in connection with their functions. The growth of the hand, together with its increase in strength, ought, for instance, to be studied. The remarkable changes in the curvature of the skull, the relative development of face and head, in short, the development of each part of the body, ought to be made the subject of most searching and careful inquiry. The results to be obtained from investigations of this kind will undoubtedly teach us how to develop the faculties of children each at its proper time.

ISOLATION OF A CHOLERA TOXINE.

HERMANN SCHOLL (*Berlin. klin. Woch.*, Oct. 13, 1890) communicates an interesting paper giving the results of some experiments with a poisonous body isolated from cultivations of the cholera bacillus. According to the *British Medical Journal*, he thinks it curious that in all previous investigations on the nature of the cholera, toxine cultivations should have been used which had been grown in the presence of air; whereas, in his opinion, in order to imitate the conditions under which the cholera bacillus grows in the human intestine, the most essential point is that the culture be grown in the absence of air. In this assumption he follows Hueppe and Cartwright Wood, who, he considers, have satisfactorily shown that the cholera bacilli grow in the small intestine in the absence of oxygen, and that their extreme virulence or rapidity of poison production depends chiefly on this anaerobic growth. Other observers, among whom Petri may be cited, think that this point requires more rigorous proof than has yet been afforded.

To obtain this anaerobic growth, the author used the method introduced by Hueppe of growing the bacilli in raw eggs, by which means he holds that oxygen is completely excluded. The inoculated eggs were kept for eighteen days at a temperature of 36° C. When opened the contents were found to give off a very powerful smell of sulphuretted hydrogen, differing in this from cultures grown in air. He describes the white of the egg at this period as being fluid and watery, the yolk firmer in consistence and black in color. In order to test the toxicity of the egg contents, five cubic centimetres of the fluid part were injected into the peritoneal cavity of a guinea-pig. The animal at first showed signs of paralysis, then convulsive movements, and died at the end of forty minutes. This proved that the fluid egg albumen was very poisonous.

The author then proceeds to describe his method of isolating the poison. Briefly, it is as follows. The fluid part of the egg contents, which amounted to 150 cubic centimetres, was dropped into ten times its volume of absolute alcohol. The white precipitate thrown down was collected and digested with 200 cubic centimetres of water at 40° C. The effect of this was to dissolve only a very small quantity of the precipitate, which was then removed by filtration. Eight cubic centimetres of the transparent filtrate were then injected into the peritoneal cavity of a guinea pig, and caused death in one minute and a half. This fluid entirely lost its poisonous properties on being boiled in the steam sterilizer for half an hour, while a short heating to 75° C. had no such effect. On the other hand, when placed at 40° C. *in vacuo*, over chloride of lime, the fluid was found next day to be completely inert.

The author then subjected the poison to the usual chemical tests, and came to the conclusion that it was no ptomaine, but a peptone, differing, however, from the toxo-peptone isolated by Petri from aerobically grown cultivations. This peptone could be obtained in a solid form by dropping the watery solution into eight to ten times its volume of a mixture of the ether and alcohol, rendered faintly acid by acetic acid. The resulting precipitate was found to be insoluble in pure water, but soluble on the addition of an alkali. After repeating this precipitation and resolution several times, pure ether was substituted for the mixture of ether and alcohol, and the peptone obtained after evaporation as a white bulky substance. A very small quantity of this dissolved in water was then injected into the peritoneal cavity of a guinea-pig. The animal at once became totally paralyzed. After half an hour convulsive movements of the head and extremities set in, and at the end of five hours the guinea-pig died. The author concludes, as the result of his experiments, (1) that the poisonous peptone, elaborated by the cholera bacilli under conditions of anaerobiosis from the albumen of the egg, is different from the toxo-peptone of Petri, since the latter was not decomposed on boiling, while the former was; (2) that this cholera pepto-toxine is much more poisonous than the toxines found by Brieger and Petri in cultures grown under aerobic conditions, since the poison obtainable from a single egg was capable of killing ten guinea-pigs in the space of ten minutes; (3) that these experiments are in favor of the contention of Hueppe and Wood that the cholera bacilli, when grown anaerobically, form a greater quantity of, and a more powerful, poison than when grown aerobically.

NOTES AND NEWS.

THE *Pedagogical Seminary* says that in Darmstadt and other large German cities pot-plants are given to school children who live in tenements. They are usually three in number and of the same size, with printed directions how to care for them. At the end of a year are exhibitions and prizes.

— At a meeting of the Royal Society, London, on June 4, the following gentlemen were duly elected fellows of the society: William Anderson, Professor Frederick Orpen Bower, Sir John Conroy, Professor Daniel John Cunningham, Dr. George M. Dawson, Edwin Bailey Elliott, Professor Percy Faraday Frankland, Percy C. Gilchrist, Dr. William Dobinson Halliburton, Oliver Heaviside, John Edward Marr, Ludwig Mond, William Napier Shaw, Professor Silvanus P. Thompson, and Captain Thomas Henry Tizard.

— According to the *Engineering and Mining Journal*, Professor Salisbury of the United States Geological Survey has made arrangements with Professor Smock, in charge of the Geological Survey of New Jersey, to undertake geological studies of the formation of the surface in sections of New Jersey, with especial reference to the glacial drift. He will begin work next month, and his study will be confined to Middlesex, Union, and Essex Counties during the summer. Monmouth and Mercer Counties may also be visited.