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ANTHROPOLOGICAL INVESTIGATIONS IN SCHOOLS.

BY FRANZ BOAS.

Physical anthropology has for its object the study of the human body and of its functions. It deals more particularly with the variations 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 stage, 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 divergencies 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 were 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.¹ Simultaneously Dr. Charles Roberts² 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 Geo. W. Peckham,³ who showed that certain important differences in the rates of growth prevail in that city and in Boston. Series of observations of less

¹ *The Growth of Children.* Eighth and Tenth Annual Reports of the State Board of Health of Massachusetts.

² *Manual of Anthropometry.* London, 1878.

³ *Sixth Annual Report of the State Board of Health of Wisconsin.*

extent were made by Pagliani in Turin in 1879,¹ by Kotelmann in Hamburg in 1877,² by Daffner in the military schools of Bavaria in 1884.³

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.⁴ 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.⁵ 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.⁶

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 born 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 which will allow the educationist to apply the results of the general method to practical cases. We have a series of investigations based on this method. Liharzik in Vienna measured 20 children regularly from the day of their birth to their 8th year and 200 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. Wretling,⁷ who measured the increases

¹ In *Untersuchungen zur Naturlehre der Menschen und der Thiere* von F. Moleschott, XII, p. 89.

² *Die Körperverhältnisse der Gelehrtenschüler des Johanneums in Hamburg.* Ztschr. d. Königl. Preuss. Statist. Bureaus, 1879.

³ *Archiv. für Anthropologie* Vol. XV, Supplement.

⁴ *Zeitschrift für Schulgesundheitspflege*, 1888.

⁵ *Ztschr. I. K. Sächsischen Statist. Bureaus* Vol. 35., No. 1, 2.

⁶ *Läroverkskomiténs betänkande. III. Bilaga E till läroverkskomiténs utlåtande och förslag. Redogörelse för den hygieniska undersökningen afgifven af komiténs ledamot Prof. Axel Key.* Stockholm, 1885. A German extract has been published by Dr. Leo Burgerstein under the title: *Axel Key's Schulhygienische Untersuchungen.* Hamburg, 1889. See also, *International Medical Congress*, Berlin.

⁷ Wretling. *Jakttagelser rörande helsotillståndet i några af Göteborgs flickskolor.* Eira, 1878.

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.¹ The studies of R. Malling—Hansen² 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,³ who followed the growth of 104 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.

¹ *Mitteilungen über das Gewicht nicht erwachsener Mädchen* (1874–1883). Medical Congress of Copenhagen, 1884.

² R. Malling-Hansen. *Perioden im Gewichte der Kinder und in der Sonnenwärme*. Fragment III A and III B. Copenhagen, 1886.

³ *Archiv für Anthropologie*, XVII, pp. 229–264.