SCOPE AND LIMITATIONS OF PHYSICAL ANTHROPOLOGY*

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FOR many years now it has been established beyond doubt that man is one of the terminal products of organic evolution, and that he achieved his humanity at a comparatively recent date in geological time. He was an animal dominated by the primitive instincts of the wild creature before he was a man capable of controlling his own destiny by his intellect. He must be studied as an animal before he can be properly appreciated and appraised as a human being. The subject which is concerned with the study of man from this point of view is physical anthropology, and it may perhaps be claimed that, of all the subdivisions of anthropological science, physical anthropology is the most fundamental, since it concerns itself with the physical nature of man, and the physical nature of man underlies ultimately all those intellectual, æsthetic, and social activities which supply the material for other branches of anthropological study.

ZOOLOGICAL POSITION OF MAN

The results of the extensive researches carried out in recent years have served to substantiate in general the views held by most anthropologists, namely, that man has relatively close systematic affinities with the anthropoid apes; in other words, that the human phylum was derived (in the evolutionary sense) from a common ancestral group which also gave rise to the modern anthropoid apes. In a number of details, however, a thorough inquiry into morphological comparisons has led to certain modifications of this generally accepted thesis. The reason for this is that comparative anatomists and palæontologists have come to realize that *parallelism* has played by no means an insignificant part in organic evolution. Now this conception considerably complicates phylogenetic problems, for it makes it necessary to distinguish between morphological similarities betokening real genetic relationship and those which are secondarily acquired as the result of convergence, that is, of evolutionary differentiation which may have occurred in the same direction in different groups independently.

It is interesting to note that, in recent years, detailed and careful comparative anatomical studies have led more and more students to the inevitable conclusion that the evolutionary history of man and the anthropoid apes has been complicated by the effects of parallelism. There remains no justification, however, for taking the extreme view that these higher primates are in no way related to each other. Such a conclusion does violence not only to all the evidence of comparative anatomy, but also to the available palæontological evidence. The very fact that parallelism has occurred between man and the apes indicates that they are *ultimately* derived from a common ancestral stock which endowed them with similar evolutionary potentialities. Moreover, even if it be accepted that the representatives of this ancestral stock could scarcely have manifested the aberrant specializations characteristic of the modern anthropoid apes, it remains reasonably certain that they must have shown in the structure of their brain, skull and dentition, anatomical characters which would demand their inclusion in the zoological category of Anthropomorpha. In other words, it remains true to say that man had a simian ancestry. This relationship is well emphasized in a new classification of mammals recently put forward by G. G. Simpson, for he includes man and the anthropoid apes in one superfamily, Hominoidea.

PALÆONTOLOGICAL EVIDENCE OF HUMAN ORIGINS

Between the Miocene genera of anthropoid apes and the earliest fossil record of man there remains a large gap in the palæontological sequence. The oldest representatives of the Hominidæ of which we have any real knowledge are Pithecanthropus from Java, and Sinanthropus from the early Pleistocene of China. The fact that some anthropologists have classified the remains of these early representatives of man as two different genera is a good example of the results of the difficulties encountered in the study of rare fossils of this type; for, since such fossils usually turn up singly, and often at intervals of several years, each one is made the subject of intensive study without the advantage of adequate material for comparison.

* Based on the presidential address to Section II (Anthropology) of the British Association delivered at Dundee on September 1.

Consequently, the anthropologist tends to exaggerate in his own mind the significance of small structural differences which, after all, may be merely an expression of interspecific or even of individual variation. This now appears to be certainly the case with *Pithecanthropus* and *Sinanthropus*, for, since the initial discovery of the type specimens, the remains of a number of other individuals have been found which emphasize the wide range of variation in both groups. Indeed, the overlap in variation between the two is quite considerable, and it is clearly desirable that they should both be included, for purposes of classification, in the one genus, *Pithecanthropus*.

The range of variation among members of this group may be illustrated by reference to the cranial capacity of adults, which varies from 750 c.c. to 1,200 c.c. Now such a range of variation in the small number of individuals which has been found is very remarkable, for in so ancient a type of man it can scarcely be attributed to the effects of extensive intermixture. The knowledge that this variability does occur should therefore guard anthropologists against making too hasty assumptions on the basis of the study of isolated specimens.

The variability manifested by these early representatives of the Hominidæ serves to emphasize the fact that the range of genetic variation in man is quite exceptional in contrast with lower animals. In other words, man is distinguished physically from other mammals not only by the possession of certain general anatomical characters, but also by the degree of variability which they show. The extent to which these genetic characters can be modified by environmental influences is also a distinctive feature of man. This variability undoubtedly has far-reaching implications in the study of all branches of anthropological science. It seems certain, for example, that it has been an important factor in the evolution of human society, for it allowed a wide range in the development of individual abilities, and also provided for the considerable plasticity which is a pre-requisite for the building up of complex types of social organization.

FUTURE OF PHYSICAL ANTHROPOLOGY

Apart from palæontology, it may be doubted whether physical anthropology is likely to advance our knowledge of racial origins and differentiation very much beyond its present state with the techniques now available. The reasons for this somewhat pessimistic prognosis include the difficulty of acquiring adequate skeletal material from which the racial composition of populations in the past can be inferred; the frequent impossibility of identifying racial types by the

examination of skeletal material only; the fallacy which may be involved in the assumption that certain craniometrical similarities necessarily indicate a true genetic affinity; and the difficulty of eliminating the effects of environmental influences in modifying physical characters which otherwise have a genetic basis.

A valuable aspect of the study of present and past populations from the historical point of view by the rigid application of biometric technique is that it permits the testing of the popular conceptions so commonly held to-day regarding the equivalence of race and nationality. No one will doubt the need for the clarification of such ideas. The physical anthropologist, indeed, has an important duty to fulfil in the discussion of modern social problems, by providing objective evidence to show whether there is any truth at all in the tenet that 'nation' and 'race' in Europe are in any instance comparable terms. Such studies as have been made on this question have hitherto led in general to negative results.

In so far as history can be said to provide a basis for prognostication, physical anthropology as a historical science has a considerable practical significance. The study of the bodily changes which man has undergone in the past gives a clue to the nature and extent of the changes which may be anticipated in the future. *But what is far more important for the same purpose is the study of man as he is to-day.* Sociological problems are becoming more and more forced on our attention and demand for their solution a conscious control of processes which have hitherto been left to chance. The improvement of health and physique and their relation to nutritional and climatic factors, the effects on physical type of the redistribution of the populations of the world, the results of the hybridization of different racial types, the relation of changes in the reproductive rate to human variability and the composition of regional populations, all these are practical problems which can be approached systematically and scientifically only if we have adequate data regarding the physical nature of man in the conditions under which he now lives.

We still lack this essential knowledge. In Great Britain, for example, there are no proper records which show the variability of different sections of the population living under different nutritional conditions and in different environments. Still less is there any real knowledge of the potentialities for growth and development of native populations living under optimal conditions of nutrition and hygiene. Yet a study of the normal variability of man to-day, and of his bodily reactions to environmental influences, must clearly be a necessary basis for any assessment of

changes which are to be anticipated in the future. Let us note briefly the lines along which physical anthropologists may most profitably seek for this information.

Human genetics. The study of human genetics offers practical problems of considerable urgency, for no one doubts that the mode of transmission of hereditary defects, which may be manifested in structural abnormalities, metabolic disorders, or susceptibility to diseases of one kind or another, should be elucidated in all possible detail. The problems of human heredity form the basis of the whole science and practice of eugenics, and the eugenicist requires to have all the data of human heredity at his disposal if he is to exert any conscious control over the destiny of mankind in the future.

Apart from the practical significance of human genetics in relation to the health and progress of mankind, this study has also a direct relation to the more academic problems of the anthropologist. Physical anthropologists have on several occasions been criticized for employing as criteria in their studies of racial affinities physical characters the genetic basis of which is unknown. No doubt such criticism is often justified, for it is clear that only those characters which are the expression of genic differences have any validity in taxonomic problems. There is evidence that the shape of the head is certainly in part determined by heredity, but there is also evidence that it can be modified by post-natal influences. Similarly, it is well recognized that the height of an individual is closely correlated with nutrition, but it is known that it also depends partly on heredity. The relative importance of genetic and environmental factors must ultimately be determined for all such characters as these.

The question of the possible linkage of phenotypic characters is another problem of human genetics which demands intensive investigation, since this phenomenon may permit the recognition of latent defects in cases where they are linked with a physical trait detectable by superficial observation or appropriate measurement. The possible relation of physique to susceptibility to disease is particularly important. It is commonly supposed that a relation of this kind does in fact exist. Physical types, such as those termed 'asthenic', 'pyknic', and 'athletic', have been defined, each with their particular advantages and weaknesses; but, so far, the evidence in favour of such a sharp classification is equivocal, and the same doubt still applies to the supposition that certain racial types are particularly susceptible to infections of one kind or another. For example, there is a current belief that the Negro, as the result of an inherited predisposition, is specially

liable to tuberculosis, and that certain types of racial miscegenation likewise lower the resistance to such diseases. Yet in a recent and careful survey by Williams and Applewhite, the conclusion is reached that there is little if any difference between the White and the Negro in resistance to tuberculosis (given equal opportunities for medical treatment), nor do miscegenetic types of the Negro really show a greater incidence of tuberculosis.

The possibility of a genetic linkage of characters also raises the question how far inherited physical traits may be related to an inherited mental disposition. It is common enough, in text-books on anthropology, to find different varieties of temperament assigned to different racial types. For example, it is stated in a recent comprehensive work on human heredity (by Dr. Lenz, professor of racial hygiene in the University of Munich) that the Mediterranean race (of which, in Europe, the southern Italians are perhaps the best representatives) is volatile and frivolous in temperament, has less sense of truth and honour than the Nordic, and, in respect of rational endowment and character, occupies an intermediate position between the Nordic and the Negro. The Nordic race, on the other hand, is supposed to be endowed with creative energy, with a vigorous imagination, high intelligence, and an unusual degree of self-control.

Physique and nutrition. The problems of human genetics and the supposed association of mental traits with demonstrable physical characters are complicated by the growing recognition during recent years that nutrition plays a highly important part in determining the physical variations seen in different races and in different individuals. It is unnecessary to state that a broad relation between nutrition and physique has always been accepted by anthropologists. Stature, weight, chest-dimensions, and so forth, can all be correlated with nutrition. But the suggestion is now put forward by competent dietitians that the effects of malnutrition may be much more extensive, not only as causal agents underlying many types of variation in physical characters, but also in determining susceptibility to different types of infection. If this is true (as it undoubtedly appears to be) it clearly demands the serious attention of physical anthropologists.

In Great Britain, indeed, evidence has been put forward which suggests that malnutrition may be far more extensive in the lower economic levels of society than has hitherto been suspected. Clinical and anthropometric comparisons of the children of relatively wealthy parents with those of poor parents have demonstrated a marked contrast in physique, general health, and susceptibility to infections. There is evidence, for example, that

the infantile mortality from respiratory infections is considerably higher in the poor districts of large towns than in the residential areas of the richer sections of the population, and there is also evidence that the predisposition to respiratory infections is related to under-nourishment. Moreover, direct experiments (although of a limited nature) have been carried out on human material in which the effects of different diets on growing children have been recorded.

It will not be doubted that, if there is indeed widespread malnutrition, it is a matter of national interest that it should be corrected as soon as possible. But an essential preliminary to any large-scale plan of action is to collect precise information regarding the extent, distribution, and degree of under-nourishment. Here is a problem in the solution of which the physical anthropologist should play a predominant part. He has at least the experience and technique which will enable him to seek an answer to one of the most urgent preliminary questions: By what somatometric method, which is both reliable and convenient of application, is it possible to assess nutritional status?

It is perhaps a matter for surprise that in Great Britain we still have no adequate standard of what may properly be called *normal* physique, as a basis for comparison when seeking for evidence of malnutrition. This is partly due to the fact that available anthropometric data apply to mixed populations from different parts of the country, in which no attempt has been made by careful clinical examination to eliminate those individuals who may be under-nourished, or otherwise unfit physically. It is also a fact that the physical standard is by no means fixed and unchanging. There is evidence, for example, that the average height of the population, not only in Great Britain but also elsewhere, is rising rather rapidly, and it has been recently estimated that this increase may be as much as one centimetre in every 12½ years. It is possible that this increase is directly referable to improved nutrition, though there are some reasons for supposing that this explanation may not be completely adequate. It remains conceivable that it may possibly represent a definite orthogenetic trend in human evolution which is manifesting itself in statistical analysis.

In order to obtain a basic standard of physique (or series of standards) for comparative studies, it is in the first place necessary to carry out a complete survey of the country by the systematic examination of samples of the population from different districts. Such a survey would require the close collaboration of physical anthropologists with clinicians, medical officers of health, dietitians, and social workers, in order to attempt a correla-

tion between physical development and the normal healthy condition of body and mind, and, if possible, to relate this also to the social conditions of life. In fact, an attempt should be made to extend the health surveys which have been recently carried out in Great Britain and a number of other countries, the aim of which has been to correlate also the clinical assessment of nutritional status with anthropometric observations.

Observations on the relation of nutrition to physique, capacity for work, and susceptibility to disease are also waiting to be carried out among native peoples in many parts of the world. Some excellent work along these lines has been started in India, Africa, and also in China, where information has been collected regarding the composition of the diet of different sections of the native population. Here the field anthropologist must necessarily give his aid, since he is in the best position to obtain a detailed record of the food elements of the diet which are ordinarily obtainable at different seasons, to study the local customs in the preparation of the food for consumption, and also to collect samples of the various foodstuffs for analytical study by the biochemist. It has already become evident from such observations that in some cases the native diet is hopelessly deficient in certain essential food elements which are necessary for the development of a normal physique and for the maintenance of health. The elucidation of such defects in the diet must surely in the future be a powerful factor for success in colonial administration.

To carry out nutritional surveys in native populations, the physical anthropologist will also require to examine the somatometric indexes which have been worked out by reference to European peoples, for they will probably need modification to adapt them to different types.

The fields of research to which we have directed attention serve once more to emphasize the fact that the physical anthropologist of the future must be essentially a field-worker if he is going to develop his subject along progressive lines. He must also be a man of sound biological training if he is to acquire a real insight into the problems which are set for him. Some of these problems have a very intimate relation to human happiness and human suffering, and their investigation is a matter of urgency.

The science of physical anthropology has contributed much to the study of the past history of the human species. By the study of modern populations it has a still more important function to fulfil: the accumulation of data on the basis of which it will be possible in some measure to control the destiny of mankind in the future.