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AN ANTHROPOLOGIST LOOKS AT MEDICINE

By Professor E. A. HOOTON

HARVARD UNIVERSITY

INTRODUCTION

AN anthropologist looks at medicine very humbly, much as a cat may venture to look at a king. Moreover, the anthropologist, like Kipling's cat, walks by himself and all people are alike to him—even doctors—at any rate as long as he is feeling well. It happens that physical anthropology is the only field of knowledge which concerns itself exclusively with human biology, except medicine. Therefore, from the dim obscurity of speculations upon man's past, present and future, the anthropologist sometimes turns an appraising eye upon the practitioners of human biology—those who are not only studying man, but are also doing something to him.

DIFFERENCES BETWEEN PHYSICAL ANTHROPOLOGY AND MEDICINE

Certain differences between the methods and purposes of physical anthropology and of medicine condition the status of each and merit brief discussion. Medicine enjoys a uniquely favorable position among the sciences, because its activities are of immediate or potential concern to every human being. "How do you do?" is a conventional form of greeting, perfunctorily reechoed by way of response to every one except a doctor. There appertains to the healer a certain supernatural sanction, a legacy from the medicine man and the shaman. He works magic—not public magic, which is the province of the priest, and, as such, re-

ligion; but private magic for the benefit of the individual, which commands a fee. As the fearful sinner recognizes in the priest the personal agent of his soul's salvation, so does the suffering patient see in the doctor the instrument of his corporeal rehabilitation. Thus, each man's preoccupation with his own carcass—a sort of physiological egocentrism—gives medicine a distinct advantage over all other sciences. Medical research receives and deserves the most lavish financial support, since it is an investment which promises and pays the sort of dividends appreciated by all.

Physical anthropology, as I have intimated, is an unobtrusive and possibly innocuous growth in the field of human biology, a lonely and disregarded tare among the wheat. If it may aspire to be called a science, it is a pure science, in the sense that it is not applied—if not indeed purely useless. It is entirely untainted, because it has virtually no pecuniary contacts. Physical anthropology concerns itself with man's origin, present status and future evolution—problems which are of little or no concern to the individual in his pursuit of personal health and happiness. Physical anthropology is neither utilitarian nor idealistic, it is merely skeptical and speculative, in the etymological sense of each. It holds up a mirror to man and lets him look at himself, with the result that he likes neither his reflection nor the agent of its production. Medicine teaches, for whatever age or sex, what every man should know, and is discreetly silent upon matters of which a lay understanding is inexpedient. Anthropology reveals many things which most persons prefer not to know, since it harps upon humble and even bestial origins, regards the present status of our species without approbation, and can predict for the man of the future no apotheosis, but only a multiplication of psychoses, dental caries, malocclusions and fallen arches, together with a full retention of his aboriginal cussedness. Under these circumstances, anthropology not only misses the material opulence achieved by an applied science, but even the comfortable circumstances of a "popular science." Not for the anthropologist is the contemplation of the celestial grandeur of the expanding universe; he looks at one animal "bereft of his tail and grown weary of climbing"; he wonders why that animal carries so much excess baggage in the way of apparently unutilized brain, and whether he would not be better off with a smaller hat size and a set of lower and upper teeth which hit.

Now there are marked contrasts in the methods of physical anthropology and of medical science, arising no doubt from their diverse approaches to the problems of human biology. Medicine must focus upon the individual, for whom something has to be done, and that right quickly. Contact with suffering evokes sympathy and engenders an attitude of noble humanitarianism, rather than one of disinterested contemplation and appraisal. It is hardly a question of not seeing the wood for the trees, but rather one of sawing wood and selling timber or of giving it away. Since life is real, and ridiculously earnest, and the grave is a goal which the patient must be led to miss at all costs, medical science is nurtured in the fetid atmosphere of pathology, and has no chance to breathe pure ozone in the congregation of *mentes sanae in corporibus sanis* (sound minds in sound bodies). All of which is a cumbersome way of saying that doctors are so preoccupied with the sick that they do not know the well and are forced to evolve the normal from their inner consciousness, as the German scholar evolved the camel. Just as New England, according to Mark Twain, has no weather, but only samples, so medical science has no subjects but only patients. Inevitably this restriction results in a faulty conception of the range of "normal" human variation, a tendency to base conclusions upon the study of numerically inadequate samples and a failure to develop and to utilize valid methods of group analysis.

In contrast, the physical anthropologist is as little concerned with the bodily welfare of any given individual as the individual with that of the anthropologist. The anthropologist is interested in groups (the larger the better). Any member of a group commands his attention merely as a component unit, exhibiting a greater or less deviation from the mean. His business is to determine the range of variation of physical characteristics in large samples of the population, classified on an ethnic basis, a sociological basis or by whatever criteria the purpose of his specific investigation may suggest. Thus, a physical anthropologist may undertake to study Italians, an ethnic group; criminals, a sociological group; babies, an age group; mountaineers, a geographical group, *et cetera*. Or he may study Italian criminals, infant mountaineers or any group selected on the basis of several categories. In every instance, however, he must avoid confusion of categories by subdividing his material into groups which may be presumed to exhibit a certain physical homogeneity. There are, for example, certain physical variations which are determined by racial heredity. Therefore, the anthropologist, in studying criminals, would not throw Negroes and whites into the same statistical series; he would analyze them separately and eventually compare the constants and characters of their respective series. He would not include Italian and American babies in the same series, nor would he lump two-year-old infants with infants of three years nor mountaineers with lowlanders. In the last two examples, differences of age or physical environment affecting bodily traits necessitate a careful sorting of

material, if group characteristics and trends are to be determined in any clear-cut fashion. Having delimited his group by such essential sortings in order to avoid confusion of issues, the anthropologist then proceeds to an examination of each component member of the group. He next advances to seriation and statistical analysis of the group data thus obtained, calculating the constants, recording the distribution of observed morphological characters, the intercorrelation of various features, and in every case taking into mathematical consideration the range of error introduced by the possibly inadequate size of the sample studied. He is then finally in a position to describe scientifically the physical characteristics of the group investigated. If, however, he wishes to go further and to differentiate between Italian criminals and Italians who are law-abiding citizens, or between mountaineers and plainsmen, he must repeat his analysis for each group adduced for comparison and must finally derive their differences from their respective arrays of characteristics.

Thus, if the anthropologist were investigating pneumonia, he would require: firstly, a large body of persons suffering from the disease; secondly, a sorting of the sufferers into statistical groups based upon race; thirdly, a further subdivision of the group, based upon age, and a possible fourth, based upon sex. All these subgroups would be subjected to separate statistical analysis before pneumonic characteristics could be scientifically isolated from confusing factors introduced by certain irrelevant biogenetic differences. But this is not all. The anthropologist would not feel that he really knew about pneumonia until he had compared his several subseries of affected subjects with similar groups of the non-infected population, each measured and analyzed in the same way. Then at last he would be in a position to reach scientific conclusions. Of course the doctor can not proceed along such investigatory channels. Before he had finished gathering his data, all his patients would have died or recovered —in either case without benefit of medicine. Such deliberate research can scarcely be undertaken by a practitioner who functions only during a crisis, and who is scientifically apathetic and professionally inert during periods of that condition described by the detestable term, "normalcy."

Nevertheless, the pedestrian methods of the anthropologist may eventually lead medical science to certain desired goals, possibly unattainable through mere utilization of the cumulative clinical experience gained by guidance of individuals through their bodily emergencies. I should like to discuss a few of the possibilities of practical contributions to medical science through the employment of anthropological methods.

PROBLEMS OF MEDICINE WHICH MIGHT BE ILLUMINATED BY ANTHROPOLOGICAL METHODS AND COOPERATION

(a) *Constitution.* The problem of constitution in its relation to medical science may be defined as the extent to which gross body type is correlated with immunity and susceptibility to various diseases. The relation of body type to disease is obviously only a part of the larger problem of the correlation of morphological variation with physiological variation, with psychological variation and with sociological behavior. Medicine has no immediate concern with some of the broader aspects of this question, although all of them engage the attention of the anthropologist. Lack of time, lack of knowledge and lack of inclination combine to prevent me from entering here into a history and critique of constitutional work in medicine, the substantial results of which, according to my possibly erroneous impression, are as yet regrettably slight. Nevertheless, I have the greatest confidence in the ultimate productiveness of research in this subject. My own positive findings respecting body build in its much farther-fetched relationship to type of crime have merely confirmed a conviction, gradually reached on other anthropological grounds. It is feasible, however, to define the essentials of correct scientific procedure in the investigation of the medical aspect of the problem—essentials, some of which, I fear, have been consistently disregarded in much of the work heretofore done. It is first of all imperative to diagnose completely and correctly the disease to be investigated. Foggy symptomatology will not do. If dementia praecox is a residuary legatee of all the bequests of psychiatric perplexity, it can hardly serve as a clinical point of departure for constitutional research. Assuming, however, that symptoms are clearly defined and diagnosis certain, it is next and equally essential that a valid scientific determination of body type be effected. Now, an actual establishment of an anthropological type, statistically demonstrable and irrefragable, is the most difficult and complex task which ever confronts a physical anthropologist. To attempt it with no more equipment than a clinical hunch and a pair of borrowed calipers is sadly ingenuous. Experience and a little mathematical knowledge will dissuade the most sanguine caliper-wielder from efforts to establish morphological types by a few raw measurements or crude indices, arbitrarily selected from the infinity of possible mensurable combinations. Type is a total morphological impression, a composite of dimensions, proportions and immensurable qualitative variations, synthesized by the brain, but through the eye, of the trained observer. Discernment of type is the ultimate acquirement of the

anthropological observer; its mathematical expression and demonstration, the most refined accomplishment of the expert biometrician. The former is useless without the latter. I can conceive of no more futile exercise than bandying about the clinic of anthropometrically unsubstantiated concepts, with dubious Greek names such as "pyknic."

The last prerequisite of a successful investigation of the problem of body build and disease is a competent method of statistical analysis, controlled by common sense and a full realization of the limitations of the data and of the ends to be achieved. The satisfactory application of such a method implies, of course, modern mechanical equipment for statistical reduction, plenty of computing assistance, together with sufficient resources, financial and moral, to carry on through years of arithmetic drudgery. There is no royal road to anthropometric analysis. The data must be sorted and analyzed, then resorted according to other categories and completely reanalyzed. This process of trial and error must continue until the possibilities of the data are exhausted. The investigator must be prepared ruthlessly to discard masses of data found to be inaccurate or irrelevant, and, if he is mathematically gifted, he must beware of the temptation to fiddle with formulae while research funds burn.

The requirements for success in constitutional study, as here laid down, are severe but not prohibitive, in view of the potential importance of the results.

(b) *Orthopedics.* The specialty known as orthopedics deals, in some degree, with bodily difficulties due to man's imperfect adaptation to an erect posture and to a biped mode of progression. Man is a made-over animal. In the course of evolution, his ancestors have functioned as arboreal pronogrades and brachiators, or arm-progressing tree-dwellers—not to mention more remote stages involving other changes of habitat, posture and mode of locomotion. This protean history has necessitated repeated patching and reconstruction of a more or less pliable and long-suffering organism. The bony framework has been warped and cramped and stretched in one part or another, in accordance with variations in the stresses and strains put upon it by different postures and by changes in body bulk. Joints devised for mobility have been readapted for stability. Muscles have had violence done to their origins and insertions, and have suffered enormous inequalities in the distribution of labor. Viscera have been pushed about hither and yon, hitched up, let down, reversed and inverted. In making a new machine out of an old one, plenty of obsolete spare parts have been left to rattle around inside. There are no few evidences of ungifted, amateur tinkering.

That the specialty of orthopedics should be based upon the very broadest knowledge and understanding of these evolutionary changes seems to me so obvious that I need not labor the point. The problems of body mechanics are in themselves tremendously complex. I suppose that no one lacking the training of an engineer can grapple with them effectively. Unless I am greatly mistaken, an adequate comprehension of bodily mechanics has not been achieved, as yet.

Two comparatively recent developments in experimental scientific facilities point the way for orthopedic progress. The first of these is the possibility of rearing the semi-erect and quadrupedal anthropoid apes in the laboratory, and of studying their postures and gaits from the point of view of bodily mechanics. These apes unquestionably illuminate the path of man's adaptations for erect posture and biped progression. It is hardly necessary to add that man himself, from infancy to senility, ought to be studied in the same way. The second modern development which facilitates orthopedic advance is the use of the x-ray photograph and the slow motion picture for the study of posture and gait and their mechanical implications. A full utilization of these technical devices for the observation of ape and human subjects, combined with anthropometric and clinical methods, can not fail to result in revelations of great practical value. Success will, however, necessitate protracted and expensive labor and a full employment of the resources of medical and anthropological science.

(c) *Pediatrics.* The study of the medical or hygienic treatment of children is, of course, an immense and valuable field of specialization. Pediatrics can pluck the heart-strings and the pocketbooks of the populace with greater facility than perhaps any other branch of medical science, because nature furnishes every normal human being with a special fund of sympathy for the young. An integral part of pediatrics is the study of human growth, which is indubitably bound up with the physiological crises and the pathological infestations of infancy, childhood and adolescence. No one, indeed, can claim that the study of human growth has been neglected of late in civilized countries. I fear, however, that much of this study has been ill-directed and purposeless, relegated for the most part to specialists in education or educational psychology (who are ready to try anything on some one else's child), to instructors in physical education and to anthropologists. Huge masses of statistics have been compiled and innumerable growth curves have been drawn, but the correlations of these data with nutritional status, with infections and with constitutional diseases are, I think, still to seek. Many growth studies have been carried on by persons who

have not been trained in the technique of anthropometry (which is by no means easy to acquire), and the measurements are consequently unreliable. The bulk of the subjects studied has not been assorted racially or even on the basis of national origins, so that the conclusions derived from the heterogeneous material are of dubious value. There are, of course, many exceptions to these generalizations, but, in my opinion, much of the effort expended in growth studies has been unintelligent and pointless. Such studies, unless undertaken for the simple purpose of demonstrating racial differences, should be so intimately associated with pediatrics as to furnish the controls and the knowledge of individual development with which to correlate the diseases and nutritional variations of childhood. This contention does not require further elaboration, because it has reached a status of almost general recognition.

However, I should like here to enter a plea in behalf of the study of age changes subsequent to adolescence. It is a lamentable fact that comparatively little is known of the terminal phases of the growth cycle (approximately between 21 and 25 years of age in males, and between 18 and 22 years in females). Actually we do not know when growth stops, nor when senile changes begin. There is a sort of general assumption that the final period of growth is succeeded by a resting phase, lasting for perhaps five years or more, after which senile decay insidiously sets in. Now it seems to me very probable that the physiological changes of middle life and old age are quite as intimately associated with disease, and consequently with medicine, as those of the advancing years of youth. The world is largely run by middle-aged and elderly individuals whose dispositions, bodily health and mental processes are presumably affected by senile changes. Consequently, it would seem that these age changes bring upon the population of every age-grade, wars, financial crises, diplomatic incidents, new deals and every other sort of social and economic evil. Hence, I venture to suggest the need of a science, or at least a medical specialty, of geratology, or the study of old age changes and their relation to disease. If the course of world events is to be altered because this old man has an enlarged prostate, that one has high blood pressure and the other has gastric ulcer or a wife going through the menopause, we have reason for desiring a somewhat fuller knowledge of the range, exact nature and general implications of bodily decline.

I will refrain from enlarging further upon relationships of anthropology and medicine, although there are many of an importance fully equal to those which I have discussed.

PROPOSAL FOR AN INSTITUTE OF CLINICAL ANTHROPOLOGY—A FOUNDATION FOR THE INVESTIGATION OF WELL BEINGS

All the foregoing considerations lead to a proposal which might profitably engage the serious consideration of medical science and of those great philanthropic foundations which alternately establish and allow to perish through inanition institutes for research to promote human betterment. In my opinion, the world is in sore need of an institute of clinical anthropology or, if you like, an institute of anthropological medicine, a foundation for the study of the biology of well beings. One might define such an institute as an organization devoted to the purpose of finding out what man is like biologically when he does not need a doctor, in order further to ascertain what he should be like after the doctor has finished with him.

I am entirely serious when I suggest that it is a very myopic medical science which works backward from the morgue, rather than forward from the cradle. I can see no bright future of scientific achievement for the healing art, if it persists in dealing only with those men who have stomachaches, and hypothecates its norms from them exclusively. The institute which I have in mind, would, of course, include physical anthropologists, whose techniques, methods of analysis and points of view I conceive to be essential to the enterprise. It would provide applications for their exact methods, too often wasted upon investigations which are, from a mundane point of view, relatively futile. The entire subject of human biology, apart from pathology, can not be investigated adequately by the physical anthropologist without the cooperation of medical science. There are in this country less than a dozen physical anthropologists who are paid to devote their entire time to this specialty, and there never will be a supply sufficient to cope with the task until an alliance with applied human biology is effected. On the other hand, there are enough and probably too many young men who are preparing to enter the medical profession, and a considerable number of them might advantageously be diverted from practice to clinical anthropological investigation. But I have intimated, and I now say quite flatly, that a medical education does not make its possessor competent to undertake research in physical anthropology, and that there seems little prospect of sound cultivation in the great field of human biology wherein may grow the nutritive plants essential for a greater materia medica, if that field is to be abandoned to the anthropologists rooting for something entirely different, and to the casual scratchings of medical leisure.

The purposes of such an institute for research in applied human biology might be enumerated as follows: to establish ranges, norms and variabilities in the fields of human morphology, physiology, psychology and neurology; to investigate age changes in man from his conception to his dissolution; to determine racial susceptibilities and immunities; to test the assumption of parallelism between human physiology and that of the higher mammals; to investigate human heredity and to apply the results of such research to medical practice; to lay the foundations for a rational science of eugenics. All these studies and many more might be undertaken with the avowed purpose of obtaining knowledge bearing directly upon medical practice, and it is medical science which would profit largely from them.

This paper is not intended to exhort medical sinners to an anthropological repentance; the anthropologist does not cast himself in the rôle of a John the Baptist, crying aloud in the wilderness—far less of a Messiah. Without any desire to crash the gates of your great profession, he peeps curiously between the bars, and comments—no doubt rashly—upon the laudable efforts of the inmates.

OBITUARY

WILLIAM ELWOOD BYERLY[1]

WILLIAM ELWOOD BYERLY was born in Philadelphia on December 13, 1849. He was educated by private tutors preparatory to entering Harvard, graduating from there with distinction in 1871. Returning to the graduate school for two years' further study, he received in 1873 one of the two first degrees of doctor of philosophy ever granted by the university. On leaving Harvard he was appointed assistant professor of mathematics at Cornell, where he remained for three years. He then returned to Harvard as assistant professor and in 1881 was promoted to full professorship. In 1905, on the death of J. M. Peirce, he was made Perkins professor. Because of threatened blindness Professor Byerly was forced to retire in 1913 from active university work, although his interest in education was undiminished until his death on December 20, 1935, at the age of eighty-seven.

Byerly's professional life was largely influenced by two unusual men. The first was Benjamin Peirce, who was Byerly's teacher both in the college and in the graduate school, and we may credit him with deciding Byerly to give his life to mathematical teaching. The second man was Evan W. Evans, his predecessor in the Cornell professorship.

Byerly's influence as a teacher was spread through his publications. Three years after commencing his work at Harvard he published "Elements of the Differential Calculus." His "Integral Calculus," a natural continuation of the "Differential," appeared in 1881. In 1893 he published "An Elementary Treatise on Fourier Series," "An Introduction to Generalized Coordinates" in 1916 and "An Introduction to the Calculus of Variations" in 1917.

Professor Byerly's contributions to education were not confined to his work at Harvard. In 1893 the National Education Association appointed a committee of ten, headed by President Eliot, to investigate teaching in American secondary schools. Byerly was vice-chairman of a subcommittee on mathematics and took a vital part in preparing their report. The total report of the committee was long held as an educational document of high significance.

An important part of Byerly's life work was his service in promoting the higher education of women, and he was actively interested in the movement which led ultimately to the establishment of Radcliffe College. Upon his retirement from active participation in the life of the college in 1913, President Eliot is quoted in part as saying "I can only say that he has been the most indispensable person connected with the growth and development of Radcliffe College."

However, there can be no doubt that Byerly's finest work in life was as a classroom teacher. He loved his subject and he loved his pupils, and the kernel of all his endeavor was the wish to make his pupils see the beauty and significance of the subject which was close to his heart. The key-note of his success was in the words "I love to teach." Through his teaching and writing he passed on inspiration in ample measure to a large number of grateful pupils who paid him in return with love and reverence.

[1] From a minute of the Faculty of Arts and Sciences, Harvard University.

GEORGE MELENDEZ WRIGHT

GEORGE MELENDEZ WRIGHT, chief of the Wildlife Division, National Park Service, was killed in an unavoidable automobile accident near Deming, New Mexico, on February 25.

Mr. Wright graduated from the University of California, College of Forestry, in 1927 but was particularly interested in wildlife protection. He became a ranger in Yosemite National Park, later serving as junior park naturalist. In 1929, at his own expense and with headquarters at Berkeley, California, he initiated a wildlife survey of the parks system to determine the existing status of animal life, help solve urgent park animal problems, and develop a wildlife policy for the National Park System. Four years