SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

FRIDAY, JULY 10, 1908

CONTENTS

MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y., or during the present summer to Wood's Hole, Mass.

PHYSICAL ANTHROPOLOGY AND ITS AIMS[1]

THE phenomena of the universe, brought within the range of human understanding and preserved in memory or writing, constitute knowledge; and systematic search for knowledge, on the basis of the highest standards of learning, is science. This in its application being of the utmost utility, constitutes the most important function of mankind. A branch of science is a portion of systematic research that extends to closely related phenomena and has become the special function of a definite class of qualified observers.

One of these branches is anthropology, described by its principal promoter, Broca, as "the natural history of the genus *homo*," or, more in detail, as "that science which has for its object the study of mankind as a whole, in its parts, and in its relation with the rest of nature."[2] In the light of to-day, it may be defined more strictly as that portion of systematic research which deals with the differences

[1] Annual address of the president of the Anthropological Society of Washington, given under the auspices of the Washington Academy of Sciences, February 11, 1908.

[2] Article "Anthropologie" in the Diction. encyclop. d. sc's. méd., Vol. V., p. 276—Paris, 1866; also in Broca's "Mémoires d'anthropologie," Paris, 1871, Vol. I., p. 1. References to numerous definitions in R. Martin, "System d. (physischen) Anthropologie, etc.," *Korr.-Bl. d. deutsch. Anthrop. Ges.*, 1907, Nr. 9/12. See also L. Manouvrier, *Rev. de l'École d'Anthrop.*, 1904, pp. 397–410, and F. Boas, "Anthropology," 8°, pp. 1–28, The Columbia University Press, N. Y., 1908.

in structure, in function, and in all other manifestations of mankind, according to time, variety, place and condition. It is the science of structural, functional and cultural differences in mankind in its epochs and its groups. That part of the science which occupies itself with the body and its functions, investigating their differences, causes, modes of development and tendencies, from man's beginning, and among his present multiple groups—the research, in brief, into man's organic and functional variations—is physical anthropology.

The comparative element is the fundamental characteristic of anthropology and that which distinguishes it from allied branches of research. It shows clearly the position of physical anthropology in relation to general human anatomy and physiology, and towards general biology. The main objects of general human anatomy and physiology are the completion of knowledge regarding structure, and its inseparable functions, in the average man of the present day; while the chief aims of general biology are to trace the structural and functional relations of the different species of living beings to one another, and search for the causes and processes of organic variation and evolution. Physical anthropology is a continuation, an extension, of all these, to the epochal, racial, other natural, social and even pathological groupings of mankind, and reaches with its investigations beyond man only so far as is necessary for understanding the phenomena which it encounters. If it had not its present designation it could well be called "advanced human anatomy and biology."

Physical anthropology is still a young branch of science, though its roots lie far back in the development of human reflection. It is interesting to know that the discovery of America, with its new race of people, was one of the main incentives to research in this line. This was followed by discoveries of other lands and peoples in the Pacific and by slowly increasing knowledge of organized beings in general, including the anthropoid apes. All this aroused new thoughts in scientific men and doubts as to the correctness of the old theories of creation; and the fermentation in minds, though greatly impeded by the power of dogma, progressed until it finally began to pierce the cloud and manifest itself in publications. Peyrere's "Preadamites" appeared in 1655, and, notwithstanding prohibitions and the small real worth of the book, was received with eagerness and read very extensively. In 1699 was published Tyson's "Comparative Anatomy of Man and Monkey." And in 1735 we see the actual foundation stone of modern anthropology laid by Linnæus. It was in Linnæus's "Systema Naturæ" that man for the first time was placed in, instead of outside, the line of living beings in general, and that his close organic relation with the rest of the primates was authoritatively expressed. Then came Buffon, with whom the new branch of the natural science of man takes a more definite form, and thence the progress towards anthropology, as differentiated to-day, is continuous. The men who contributed towards its development are too numerous to mention; they include all the prominent naturalists and anatomists of the latter half of the eighteenth and the first half of the nineteenth century, such as Camper, Lamarck, Blumenbach, Soemmering, Lacépéde, Cuvier, Retzius, the brothers Geoffroy, Morton, Lawrence, Edwards, Serres, Pritchard and many others.[3] Even the teachings of

[3] For details concerning the history of anthropology see T. Bendyshe, *Mem. Anthrop. Soc. London*, Vol. I., 1863–4, pp. 335–458; P. Topinard's "Elements d'Anthropologie générale," Paris, 1885, pp. 1–148; L. Niederle, *Athenæum*, Prague,

Gall, however erroneous in application, have assisted its growth, for they stimulated research regarding the variations of the head, skull and brain, and were the main incentive to Morton's remarkable work "Crania Americana." And the discussions of the mono- and polygenists, particularly those of the nineteenth century, were of great importance in this connection.

The first effort at some organization of forces in the new line was made as early as 1800, when a small body of scientific men formed themselves, in Paris, into a Society of Students of Man (Société des observateurs de l'homme). It was in this little circle that the term anthropology (used previously as a title for some works on man of philosophical and in a few instances of simple anatomical nature) was employed in something like its present significance. This attempt at organization was, however, premature and had to be given up two years later (1803), after but little had been accomplished. In 1832 the Paris Museum of Natural History, under the influence of Professor William Edwards, transformed its chair of anatomy into that of natural history of man, and to this Serres, in 1839, added anthropology; but the time was still not ripe for the subject to assume much importance. From 1839 to 1848 Paris had a Society of Ethnology, which included the physical branch, again with but little result. It was not until the commencement of the second half of the nineteenth century, with the advent of Paul Broca and his collaborators, and the foundation of the Paris "Société d'anthropologie" (1859), that the actual birth of the new branch of science took place. This is less than fifty years ago; and how difficult the beginnings were even then will be appreciated from the following recently published[4] details. When permission to establish the society was sought, the minister of public instruction, notwithstanding the rank and fame of the men who with Broca applied for the sanction, refused to have anything to do with the matter. He sent the petition to the prefect of police, but the prefect was equally unwilling and returned the document to the ministry as he received it. It was not until after the influential intervention of Ambroise Tardieu, that one of the chiefs of the police department was persuaded the scientific gentlemen in question were not quite as dangerous to the welfare of the empire or society as was suspected, and not finding, besides, any law that forbade the gathering of less than twenty persons, he informed the eighteen future anthropologists that their meetings would be tolerated. But Broca was made responsible for anything that might be said at the meetings against the government or religion, and every meeting was to be attended by a plainly dressed officer.

From the establishment of the Société d'anthropologie the progress of the new branch of research was more rapid. Before long similar societies were organized in England, Germany and other countries; the publication of anthropological journals was commenced; an efficient system of anthropometry, with the required instruments, was devised, principally by Broca, and detailed instructions in the system were published by the same author; collections and important lines of research were begun in different parts of Europe and also in the United States; and in 1876 was founded the Paris School of

1889 (repr. pp. 1–19); F. Boas, SCIENCE, Oct. 21, 1904, pp. 513–524; references to more or less direct contributions to the subject in R. Martin, o. c.; and the "Recent Progress in American Anthropology," *Am. Anthrop.*, Vol. 8, No. 3, 1906, pp. 441–556.

[4] "L'Ecole d'Anthropologie de Paris," 1876–1906, 8vo, Paris (F. Alcan), 1907.

Anthropology, for academic instruction and training in the new branch of science. Finally, in 1885, appeared Paul Topinard's great text-book on anthropology, the "Élements d'anthropologie générale," which to this day is an indispensable volume in our laboratories. A long step was made during this time in the differentiation of anthropology as a whole into its main subdivisions, namely, physical anthropology, ethnology and archeology.

But this period of the first twenty-five years of anthropology as a separate branch of learning, a period of the greatest activity, the detailed and still unwritten history of which is of absorbing interest, was not one of uninterrupted progress. There was encountered, above all, a crisis which affected especially physical anthropology and from the effects of which it is only now beginning to recover. This crisis was the result of what may be called a schism in anthropometry, begun in 1874 by Ihering and completed in 1882 by the German anthropologists at Frankfurt. This is not the place for a discussion of the causes or details of the case; it suffices to say that at the present time a commission, composed of the foremost physical anthropologists of Europe—French, German and from other countries—is endeavoring, and with much success, to select the best from the existing methods in anthropometry and bring about a much-needed uniformity.[5] A complete agreement on this subject will be of the greatest importance and mark an epoch in our branch of learning.

This chapter, necessarily superficial, will be appropriately concluded with a few words concerning the actual status of physical anthropology. The subject, like the whole history of this science, calls for a thorough presentation, but such is out of the question in an address of this nature.

Physical anthropology counts distinguished followers wherever science progresses; it has already an extensive bibliography of its own; it maintains a number of well-equipped laboratories, where students are trained; it possesses a large series of important collections of material for investigation; it contributes the bulk of original matter to well-established anthropological journals of high standing, such as the *Bulletins et Mémoires de la Société d'anthropologie de Paris,* the *Archiv für Anthropologie,* the *Zeitschrift für Morphologie und Anthropologie, Biometrica, Man,* etc., while numerous other results of investigation are being disseminated through periodicals devoted to anatomy, general biology, and to other subdivisions of anthropology; finally, it is a subject or a part of instruction in the École d'anthropologie, in the Anthropological Institute of Zurich University, in several large museums, and in one or more of the principal universities in almost all civilized countries.[6] It is still struggling with numerous difficulties which retard it, but, unless development in science stops, it has before it a wide and useful future.

II

The questions are often asked by those

[5] For what has been accomplished see F. v. Luschan, "Die Konferenz von Monaco," *Korr.-Bl. d. d. Ges. f. Anthrop., etc.,* Juli, 1906, pp. 53 et seq.—in *Arch. f. Anthrop.,* 1906, H. 1–2; and "Entente internationale pour l'unification des mesures craniométriques et céphalométriques," *L'Anthropologie,* 1906, pp. 559–572.

[6] For information regarding instruction in anthropology see J. Ranke, in Lexis, 1896, p. 117; W. Waldeyer, *Korr.-Bl. d. d. Ges. f. Anthrop., etc.,* 1896, p. 70; G. G. MacCurdy, Science, Dec. 22, 1899, and Feb. 7, 1902; "Recent Progress in Anthropology" (a review of the activities of American institutions and individuals from 1902 to 1906), *Amer. Anthropol.,* Vol. 8, No. 3, 1906; R. Verneau, *Bull. et Mém. Soc. d'Anthrop. de Paris,* 1902, p. 12, and *l'Anthropologie,* 1904, pp. 113, 252 and 483.

whose preoccupations have not permitted closer following of this branch of research, what has physical anthropology accomplished, and what are its aims for the future. Both of these are weighty questions and deserve to be answered.

The amount of work actually done must be considered, together with the obstacles that have stood in the way of fruitful investigation. The greatest of these obstacles has been the imperfect state of anatomical knowledge, which is the starting point of physical anthropology. It is obvious that structural comparison, extending to various groups of humanity, can properly be carried on only on the basis of a thorough knowledge of structure in some one type of man, preferably the white race. Had anatomy been able to furnish such a foundation to physical anthropology, the progress of the latter would have been immeasurably easier and more rapid. As it was, the new branch began to differentiate itself while general human anatomy was yet very imperfect, and in consequence it was confronted with the tedious task of establishing or improving the basis for its future comparisons. Thus a large portion of the work of anthropologists became and still is purely anatomical. It is safe to say that fifty years ago, when the Paris society of anthropology was founded, there was not one point in any part of the human organism that was well known and understood. Even at this day, with all the excellent work accomplished, there is not yet a single bone in the body, and perhaps no other organ, the knowledge of which together with that of its total range of variation is perfect, and that even in the white race alone, which has been most studied. The splendid anatomical text-books of the day give little more than generalities. The specialized literature is much richer; but when one comes to details, there are innumerable lacunæ. Yet details are to-day the essentials of all research, and they are indispensable in anthropological comparisons. It would almost seem from this that the birth of physical anthropology had been premature; but if one stops to consider the deep interest its problems have for humanity, it is seen that its early rise, even on the but partly prepared soil, was natural.

The second great obstacle to the progress of physical anthropology has been the defects in collections of needed material. The third was the dearth of properly trained men, and in the fourth place should be named the difficulties, based on various prejudices or want of comprehension, attending the collection of accurate anthropological data in many parts of the uncivilized and even the civilized world. Still further impediments, attending this more than other branches of natural science, were those accompanying the elaboration of the necessarily extensive series of data and especially their publication.

With regard to material, what collections of value for physical anthropology were there half a century ago? Fair beginnings had been made by that time in a number of the European cities, and one particularly interesting one on this continent—that of Morton in Philadelphia; but all this was limited to crania and was useful in awakening suggestions rather than leading to definite conclusions. It required years of assiduous collection and excavation before actual scientific work of any extent could anywhere be attempted. Such collection has been going on, and there are now several great and many minor gatherings of identified material, including those in the National and other American museums. Yet even now we are far from the ideal in this direction, or from collections which would include at least the bones of the whole skeleton, and the brain, and enable us to determine the complete range

of variation in these parts of special importance in at least the most significant groups of humanity. What is required in this line will be clearer when it is appreciated that, to determine the total range of variation in a single long bone, such as, for instance, the humerus, in any particular group to be studied, there are needed the remains of hundreds of individuals of one sex from that group. As it is, even the greatest collections fall still far short of the requirements, and the investigations carried on with them can be seldom perfect or final.

The dearth of properly trained men has been a great hindrance in physical anthropology. The cause of this is simple enough. The branch demands extensive preparation and arduous work, for which it offers at best only moderate pecuniary reward. It has not yet reached the stage of its ultimate public utility and in consequence receives much less public recognition than the so-called applied sciences. Under these circumstances the recruiting of regular workers of the right class is precarious, a new physical anthropologist is almost an accident and the supply of students is far short of what is needed.

The difficulties of gathering the requisite material, and even the data alone, have been infinite and are still very great; in fact they are sometimes quite insurmountable. Religious beliefs and superstition, but also love, cover the dead body everywhere with a sacredness or awe, which no man is willingly permitted to disturb. It is not appreciated that the secured remains are guarded in the laboratory with the utmost care and for the most worthy ends, including the benefit of the living. The minds of the friends are only apprehensive of mutilation and sacrilege, or simply fear the disturbance. These conditions extend with small exceptions to the civilized and savage alike, and to collect, in their presence, large supplies of material indispensable to physical anthropology is often very arduous and unsatisfactory. The impediment that this constitutes to the advance of the science is beyond computation. And the difficulties extend even to the data on the living. The stumbling blocks due to ignorance and superstition are particularly numerous in the way of measuring, and are met with even among the otherwise most enlightened. Compare with this the facilities of the zoologist or botanist!

Notwithstanding these and other obstacles, among others those placed in its way by the ill-fitted or fool investigator, physical anthropology has already accomplished considerable useful work. It has established a system of precise measuring of man and his remains, and has furnished the needed instruments; it has directly advanced general anatomy, particularly that of the skeletal system and brain of man and other primates, and contributed to zoology, general biology and other natural sciences; it has established the physical knowledge of the races and many of their subdivisions, and has aided through its activities the advance of its sister branches, ethnology and archeology; it has given a far-reaching impetus to search for the remains of early man, and has determined the physical characteristics of the finds made; it has actuated and to a large extent carried out the study of man's development from his inception onward; it has brought about physical investigation and through this a vast improvement in our knowledge of the criminal and other defective classes; it has led directly to the practical systems of identification of criminals; it has taken part in and promoted the studies in human heredity, variation, degeneration and hybridity; it has added to knowledge of the functions and pathology of the human body and

especially of the brain; it has furthered vital statistics; and it has already begun to assist other branches in pointing out, on the basis of gained knowledge, ways towards the safeguarding and improving of the human race. This outline is necessarily defective, yet it will show that physical anthropology, notwithstanding the many and great obstacles in its road, has justified its separate existence, and the decrees by which the French government pronounced it, in 1864 and again in 1889, as a science of public utility.

III

The object of the final chapter of this address is to outline in a brief way, and yet not too generally, the future field and aims, in a word the future program—as it appears to the speaker—of physical anthropology. Could such a program be perfected, it would itself mean an important step forward.[7]

The future activities of physical anthropology must extend to its own body and means, as well as to further research work proper; the more extensive and efficient the former, the more important and prompt will be the scientific results.

The main needs—which logically become the aims—of the anthropologists themselves, include more regular and extended recruiting of their ranks; a closer general unity and cooperation; definite unification and perfection of anthropometry in its whole range; systematization of the methods of treating and recording of data; the supply of fresh text-books, and advance towards strictly specialized periodicals; the compilation of a complete bibliography relating to this branch of research, and its continuation; the generalizing of information concerning collections of material; and the augmentation and improvement of collections.

Recruiting with the right kind of men is very urgent. It conditions further development of academic instruction and laboratory training; it makes very desirable the extension of lectures on physical anthropology to medical colleges; but, above all, it necessitates financial resources from which scholarships could be offered to men to be trained in the laboratory and in the field, and an improvement in the prospects of their employment with fair compensation after their preparatory studies and training have been completed. The time required for the proper training of the physical anthropologist, coupled with that needed for the acquisition of indispensable experience, extends over several years of post-graduate activity, and as the men who are best prepared for such training and most likely to be interested are those who have completed a medical course, these years of specialized training and work mean a real pecuniary loss, which ought to be at least partly indemnified. Until provision is made in this point it can not be expected that the requisite numbers of students will be attracted to and will specialize in physical anthropology. And this applies particularly to this country, where the prospects of the graduate in medicine—as well as in other sciences—are brighter than in many parts of the old world. The most suitable means of compensation during the preparatory years would be scholarships, continued with the right kind of men until they find positions. The opportunities of employment for well-trained anthropologists are not so few as one might be led to believe; the principal problem is to augment the compensation, so that it may correspond better to the needed preparation and with the prospects of a man as well trained, had he followed

[7] See in this connection, and for further references to literature on this subject, R. Martin's above cited paper on the "System of Physical Anthropology and Anthropological Bibliography."

another vocation, such as that of the physician.

Closer unity and cooperation among physical anthropologists of different countries must always be one of our cherished aims, and the same is true of the unification and perfection of anthropometrical processes and standards, as well as the methods of dealing with anthropometric data and their recording. Concerning the latter, the establishment of definite rules is still distant, the whole subject being in the process of evolution. One of the main questions, accentuated especially since the establishment of the journal *Biometrica*, relates to the employment and utility of higher mathematics in the analysis and presentation of the data. A simple exposition of facts, intelligible to every educated person, carries with it so great an advantage to every branch of investigation and to the public as well, that the matter of the extensive use of algebraic formulæ in publication can not be passed over lightly. It would be folly to oppose the legitimate use of higher mathematics, which in special cases excel all other methods, and may, in fact, be the only means by which to arrive at a solution of a given problem; but when it comes to the presentation of the results arrived at, it can not be denied that the high-mathematical method, while finding special favor with some, abstracts the subject from critical perusal by a large percentage of scientific men, not to speak of others. The whole matter demands very careful attention.

A supply of up-to-date text-books is a pressing need. It was twenty years ago that Topinard's great handbook appeared and nothing has been produced since that would bring it up to date or replace it. Yet a considerable advance has been made in every direction and the need of a thorough presentation of the accumulated facts and changes is acute. There is hope that the unification and precision of anthropometric methods, inaugurated two years ago at the Congress of Monaco, will stimulate efforts in this direction.

An advance towards strictly specialized periodicals, to be devoted exclusively to physical anthropology, is merely an aim at a further step in differentiation, such as is manifested in all other branches of research, after they have reached a certain stage of development. It depends upon the strengthening of the ranks of the physical anthropologists.

The importance of complete and continued bibliographical record is evident enough to every student and author and is an aim calling for the earliest possible realization. Beginnings in this line have already been made, particularly with current literature, and more is promised, but the movement calls for definite organization and extension to the older publications.

Improvement in and generalization of information concerning collections in physical anthropology are highly desirable. Such information, furnished through periodically supplemented registers of material by and to all institutions, would greatly promote collaboration as well as the extent of research. An additional procedure of much consequence would be the deposit of smaller collections in larger centers in each country, where they could be better cared for and be more available.

Finally, a matter of vital concern to physical anthropology is the augmentation and improvement of its collections. It is necessary that these be supplemented in a more systematic manner than has been done hitherto, and in all particulars. There are needed much additional osseous material, including all parts of the skeleton, for racial and other group studies; ample developmental series, on which could be determined racial and other peculiarities

in all stages of growth; the largest possible acquisitions of skeletal remains from all the periods of peoples known the longest to history, such as the Egyptians, the Semites, the Chinese, for the ascertainment of physical variations in different localities in known time; large collections of brains, preserved by uniform methods, for the study of gross, minute and chemical differences in that organ, in definite groups of humanity; and substantial series of at least the skeletal parts and brains of the anthropoid and other apes, for purposes of comparison. The existing material, as well as that to be added, should be held in the best possible condition regarding identification, cleaning, repairs and preservation. All these are conditions, on the fulfilment of which further advance in physical anthropology depends directly. Other objects needed, at least in our great museums, are series of specimens fit for exhibition, for illustrating to the public the most interesting human variations; and large gatherings of good photographs, as well as accurate casts, fit for both study and exhibition.

The above by no means exhausts what may be termed the internal wants and therefore aims of physical anthropology. There still remain the very important objects, of the virile development and advance of teaching; the highest of our hopes, namely, the foundation of separate central institutes of physical anthropology, like the École d'anthropologie; the forming of a special, international association; the conservation of original, detailed data, etc. But these are largely matters of development of the branch, dependent on progress realized in the points before specified, and their discussion can be postponed.

This leads to the scientific aims proper of physical anthropology, and these are innumerable. They extend from questions of pure science and natural philosophy to those of high practical utility, and from those of local interests to those of all humanity. I shall pass briefly over those of a more general nature and conclude with those that are more specially American.

The most urgent and important scientific object before physical anthropology is the gradual completion—in collaboration with anatomists, physiologists, and even the chemists—of the study of the normal white man living under average conditions, and of the complete range of his variations—these facts to form a solid and sufficient basis for all comparisons. This goal is still very distant, notwithstanding the mass of work already accomplished. It is necessary to renew and extend the investigations on every feature, every organ, every function of the medium white man, until these are known in every detail. The facility and value of all comparative work will increase in direct proportion to the degree of the consummation of efforts in this direction. The choice of the white man for the standard is merely a matter of convenience; the yellow-brown or black man would do equally as well, if not better, were he available.

The second task of physical anthropology is to perfect, or aid in perfecting, detailed knowledge of the structure, function and chemical composition—with their variations—in the primates. This field of investigation may be regarded as the vestibule to the space occupied by man's natural history and is indispensable to the understanding of man's past and continued evolution, collectively and in every particular. The fossil forms of the primates must naturally be comprised with the living.

The third great duty of our science is the determination of development and variation in man's structure, and also as far as possible in other organic qualities—particularly those of chemical nature—in rela-

tion to time. This comprises a delicate and thorough study of every specimen of man of geological, and ample series of those of historical, antiquity. Research as to the bones of the geologically early man has been painstaking, but the specimens themselves are still very limited in number and imperfect; while the study of man's variations within the time of which there is closer and finally historical knowledge, is still in its infancy. The investigations here mentioned relate principally to the important phase of man's evolution as man.

The fourth leading object of physical anthropology is the study of the human races and their subdivisions. This subject has attracted attention since the earliest time, and contributions to the theme are numerous as well as important; yet the road to go is still much longer than that already traveled. The very term "race" awaits as yet a definition that would be universally adopted. There are still immense territories in Asia, Africa, Oceania and America, concerning the populations of which our knowledge is very rudimentary, or wholly deficient; and the subdivisions of the white race still offer a vast field for further investigation. The appreciation of what remains to be done on the races and tribes of man impresses one forcibly with the fact that we are still only in the beginnings of this study and barely emerging from empiricism. The future work in this special field must be more extensive, systematized and critical.

Directly connected with racial studies, but of more serious concern to many nations, are investigations into the effects on the progeny, physical and potential, of racial mixtures. Mixture of races is a matter which can be brought largely under control through law and through general enlightenment. In view of this, a precise knowledge on the subject is a necessity, and to furnish it must be one of the main aims of anthropology.

Next in sequence, but not in importance, are studies concerning the numerous environmental groups of humanity—of groups developed and continuing under extremes of elevation, climate and nourishment; or under the greatest specializations in clothing, food, occupation or habits that are liable to permanently affect the body or its functions. All such conditions are followed by functional and structural accommodations of the system, and it is to be determined how they eventually affect the progeny. Learning the exact facts in these lines is beset with great difficulties, but the results are bound to be of much practical, as well as scientific, utility.

A still further extension of the studies takes up the pathological groups of mankind, including the alcoholics, epileptics, insane, idiots, perverts and other defectives or degenerates, and also criminals. This part of anthropological research is already well advanced and has, with the help of medical men, accomplished much of immediate benefit to society. But the aims of scientific work in this direction, a complete knowledge of these classes, are yet far from having been attained. Their realization depends to a very large extent upon the perfect understanding of the normal contingent of the human family.

Somewhat separate from all the preceding are studies in human ontogeny, or the development of the individual from birth onward, in all divisions of mankind and under all specific conditions. The contributions to knowledge in this line have already been substantial, though almost restricted to the whites. One of the most interesting parts of this study will be that of man's decline in the different races and under various definite conditions.

Finally, the ultimate aim of physical anthropology is to show, on the basis of

accumulated knowledge, and together with other branches of research, the tendencies of the future evolution of man and lay down indications for its possible regulation or improvement.

A few words in conclusion regarding the duties of physical anthropology in this country and in America in general. American students ought to contribute, as much as lies in their power, to knowledge concerning the white race at large and of other peoples outside of this continent with its dependencies. They have already added in no small degree to the study of child growth and should not stop in this direction; they should also cooperate in all investigations concerning special, environmental and pathological, groups of humanity. But there are several problems which will be to them of especial importance and demand the bulk of their labor. These are: (1) The appearance of man in America; (2) the composition and detailed characteristics, with their complete range of variation, and the affinities, of the indigenous race, including the Eskimo; (3) the crystallization of the new contingents of the white race in America, particularly in the United States; (4) the development of the negro element, especially in this country; and (5) the effects of the mixture of the white with the negro and the Indian. Beside these range themselves parallel problems affecting the insular possessions of the United States. All these are scientifically, as well as practically, serious questions, and research into them deserves to be generally promoted. There is no other branch of natural science which can occupy itself with them and define them; they are the rôle of physical anthropology in this country and demand its development.

ALEŠ HRDLIČKA
U. S. NATIONAL MUSEUM

THE HANOVER MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE special summer meeting of the American Association for the Advancement of Science held at Hanover, N. H., on the invitation of Dartmouth College, from June 29 to July 2, took place in accordance with the program that has already been printed in SCIENCE. The local committee, with Dean Robert Fletcher as chairman and Professor H. H. Horne as secretary, had made admirable arrangements for the reception and entertainment of members, and the college campus and buildings and the beautiful surrounding country were of even greater interest than had been anticipated.

The meeting was called to order at 8 P.M. on June 29 in the auditorium of Dartmouth Hall, and an address of welcome was given by the acting president of the college, Dr. John King Lord, who drew attention to the large place science now has in the college curriculum as compared with the conditions when the college was founded some one hundred and forty years ago. The president of the association, Dr. T. C. Chamberlin, of the University of Chicago, responded on behalf of the association and the visiting members. He laid stress on the increasing use of the scientific method in all subjects included in the college course and the importance of this movement for the future of society.

On Tuesday and Wednesday, June 30 and July 1, Section B and Section E of the association held sessions for the reading of scientific papers in conjunction with the American Physical Society and the Geological Society of America. Reports of the proceedings will be published subsequently in this journal. On the evening of June 30, Professor J. W. Spencer gave a public lecture entitled "The Spoliation of Niagara," and on July 1 Mr. J. S. Palmer lectured on "The American