to know himself. The message of science to mankind has ever been the message of intellectual enlightenment and liberty, "Ye shall know the truth and the truth shall make you free."

The greatest contribution of biology to intellectual emancipation has been the doctrine of evolution, that great theory which has revolutionized all our thinking regarding man and nature. And evolution is the distinctive contribution of biology to civilization, for it was in the living world and especially in the human realm that the doctrine of evolution came as the great emancipator from superstition and ignorance. The greatest theme of evolution is not the origin of species, nor even the origin of living things, but rather the oneness of all life. This is indeed the greatest principle of biology, namely, that through all the endless diversity of the living world there runs this fundamental similarity and unity. We also are living things and all that concerns other forms of life is of direct interest to us. In the lower organisms we see ourselves in simpler and more primitive form; we see man from the standpoint of the whole living world, as superior beings in another planet might look upon us, and as a result we have ceased to a large extent to regard the universe as existing merely for us. In this intellectual revolution we have ceased to occupy a position of solitary grandeur in a little human universe; we have not grown less, but nature has become so much greater that man's relative position in nature has changed.

Contrast the old view of creation, that the universe was made in six literal days, with the revelations of science as to the immensity and eternity of natural processes. Contrast the old view that all organisms arose suddenly by divine fiat with the view that animals and plants and the world itself are the result of an immensely long process of evolution. Contrast the old anthropocentric view of nature and of man with the new biocentric view which evolution has revealed; the old notion that man was absolutely distinct from all other creatures with the new conception of the oneness of life. As Darwin so beautifully says,

> There is grandeur in this view of life with its several powers having been breathed by the Creator into a few forms or into one, and that whilst this planet has gone cycling on according to the first law of gravity from so simple a beginning endless forms most beautiful and most wonderful have been and are being evolved.

Biology has changed our whole point of view as to nature and man and has thus contributed more than any other science to the intellectual emancipation of mankind.

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THE VALUE OF SCIENTIFIC GENEALOGY

FROM out of the middle ages when learning was treasured by encloistered scholastics has come the tradition that science is necessarily esoteric; and that pure science has little or nothing to do with human affairs; and thus is to be contrasted sharply with the humanities. During the past half century anthropology, social as well as physical psychology and psychiatry, and medicine have developed into well-recognized sciences proceeding by methods as objective and experimental as physics or chemistry and contributing to our knowledge of the field lying between the sciences of biology and chemistry; and of behavior and morphology. To-day the man of science is quite willing not only to apply to the human species the laws that have been determined by the study of other organisms, but he is recognizing that man himself is as good material to use in getting at scientific principles as any other species; and that in certain subjects man affords the *best* mate-

rial for scientific investigation, and that the investigation of man gives a peculiar zest to research because the results are so obviously applicable to our human life. No doubt these considerations are responsible for the fact that to-day we are enquiring into the value of scientific genealogy.

Although the copy-book states that man is an animal, it appears that, until recently, zoologists considered that man is an anthropos and they had nothing to do with him. And so long as the work of the biologist was the description of species, or the study of structure this attitude had a certain justification. But a new era has arisen; an era in which for certain studies the old classifications of botany, zoology and anthropology are being disregarded. These studies may be grouped under the head of general biology. This field includes such matters as general cytology (embracing maturation and fertilization), general embryology (including physiology and chemistry of development), genetics, and general physiology (including irritability). And we find that the phenomena of these sciences are the same for *all organisms* and that all may be used to contribute data to these sciences. And now any biologist feels at liberty to use any material, from any "kingdom," for his studies.

Not only in this matter, but in another, a great change has entered the spirit of our dreams. Formerly the zoologist, still cherishing in manhood the childish delight of collecting animals and studying with uninhibited enthusiasm the details of their structure, found it difficult to answer the question that his fellow human beings put to him, "What are your studies good for?" was able to show few points of contact between zoology and human affairs (except the fisheries and some parasites) and so assumed the lofty attitude of esotericism. But now the biologist is dealing with facts whose bearings are appreciated by any fairly well educated layman. Workers in any one of the fields of general biology are apt to be *importuned* by publishers; and there are men, though few in number, who live in luxury by writing books and giving popular lectures on biological topics! We have hardly to urge the importance of biology to humanity.

In no field of biology is there a greater popular recognition of the importance of biological research than in that of genetics. The reality and the bearing of the new science have gained a general recognition; the realization of the limitations of the methods of amelioration and of training and of hygiene have paved the way for such recognition; and to-day people are coming to look at man as the biologist does, namely, as an animal, comprising hundreds of elementary species, whose potentialities for physical, intellectual and moral development differ tremendously.

If there were anywhere a community that was wholly isolated, whose progenitors were exactly or very closely alike and which was highly inbred, then all the members of that hypothetical community would belong to the same species and it would follow that the facts of genetics would have little importance for such a community, and there would be little need in such a community for a scientific genealogy. But, as a matter of fact, the human race is practising what is, perhaps, the biggest experiment in hybridization that the world has ever seen. And this vast experiment is pregnant with possibilities for good or evil so great that they can not be calculated. Any practical breeder who was carrying on such an enormous system of cross breeding and attempted to keep the details in his head would be recognized as guilty of a colossal folly; and no scientific breeder would, of course, be capable of such

a thing. And yet this precious human kind of ours, whose progress is so fateful to the world, goes its blind way, like any jelly-fish, mates almost at random and then, after two or three generations, has lost all knowledge of the matings that have gone before. Of course, the race has got along, somehow, just as the lower animals get along; although we have been burdened with an intelligence sufficient to lead us to interfere with the operation of pure instinct but not sufficient always to interfere wisely. There are those who urge that the matter of marriage selection should be left to instinct; forgetting that in adult man (with his enormous development of the inhibitions) instinct has been so repressed as to have become a very unsafe guide. There are those who adhere to the obviously false doctrine that men are born equal and therefore it really doesn't matter who marries whom. It is, however, easy to show that it does matter tremendously. Also I think it quite within the range of possibilities that it will become incorporated into the mores that persons who are thinking of marrying should learn something about the genealogical history of the proposed parents of their children. And, again, it is highly probable that, after we have learned the method of inheritance of racial traits and can state the consequences (certain or probable) of particular matings, that such precise knowledge will influence human conduct even as a knowledge of the causes of yellow fever has influenced human conduct and has led to a vast reduction in the morbidity from that disease. When our knowledge of the inheritance of racial characteristics becomes fairly complete and widely diffused it can not be doubted that such knowledge will influence many selections of mates.

The fact that the nature of the mating does influence the progeny is well brought out by the study of half fraternities, both those in which the father and those in which the mother is the common parent. The economic and other environmental conditions are as similar as possible; the difference in the progeny is therefore the more readily ascribed to the difference in blood. I have collected many of these cases of double matings; and one of them may serve us now as an illustration.

A man whom we may call John Wolley, born 1668, son of a merchant and his wife (sister of the first rector of Yale College), graduated from Harvard College, entered the ministry and finally settled in a church in southeastern Connecticut. He had no brother who survived infancy, but three sisters who married well. This John married twice. His first marriage was to a widow, Martha *née* Silver. About the Silvers of that day I can learn little; they were apparently quiet, steady folk who took no very active part in the affairs of the community. Martha is described in the town minutes as "that eminently pious and very virtuous matron." This couple had 7 children of whom one died at 9 years, leaving 6—4 girls and 2 boys—to grow up. Of the younger son we know only that he was born, married and died, having held the office of deacon. The other brother, at his father's death, removed to a farm five miles back from the village which his father had received as a testimony of regard from the town. In his will the father asked the son to improve the farm (about 500 acres) thus left him. The son lived on the farm, married a woman of no outstanding name, with 23 others founded a church near by, and died at the age of 44 years, leaving 14 children, of whom the eldest was not yet 19. Of these 14 children, 9 were sons and apparently none died in infancy but of all the nine sons there is nothing of importance to note of any except birth, marriage and

death, and except that one son was a lieutenant in the Revolutionary war and died in battle. The eldest of these 9 sons had 2 daughters and 2 sons. All died in early life, except one son who cultivated the farm, built houses with his own hand, married into a good family and had two sons, born 1789 and 1787, who survived early youth and both of whom became quiet, steady farmers, noted for their common sense and contentment.

The Rev. Wolley, born 1668, of Connecticut, married a second time; this time to a daughter of John Morris, of one of the leading families of New York and New Jersey of colonial times—great landholders from which Morrisania, now in the Bronx Borough, New York City, and Morris County, New Jersey, are named, and from this union there were two sons. The elder of them was Benjamin Wolley, graduated Yale College, 1732, and married a daughter of Jonathan Edwards's sister. He held the highest position the town had to offer, represented the town in the state legislature through 25 sessions and was for a time clerk of the house; was state senator for 8 years, and was judge of probate and county judge to his death. During the Revolution he helped organize the army; was one of the committee of safety for the state and was always consulted by Governor Trumbull and General Washington as one of the wisest counselors in one of our most trying days. During a session of the legislature occurred the "Dark Day" of 1780; when it was proposed to adjourn the legislature on account of the impending judgment day, he opposed the motion on the ground that its duty lay in proceeding and asked to have candles brought in. This Benjamin had a brother Thomas who graduated from Yale College, entered the ministry, took part in the "Great Awakening" of Whitfield, showed signs of extraordinary elation, set out on a tour of evangelization, once addressed an audience for 24 hours and then fell into a depressed state. Again elated, he ran into great extravagances, threw suspicion on ministers who did not sympathize with his work, called on the people to commit to the flames jewelry, rings, their best clothing and various books which were listed on his index expurgatorious. He then returned to a more normal state again, renounced his former methods, and lived a quiet life during the 12 years that he survived.

Benjamin Wolley and the niece of Jonathan Edwards had a son, John, graduated from Yale College, 1770, took an influential position in the Revolution; was in congress for 18 years, and held positions on the most important committees. His only brother (Henry), graduated from Yale, 1779, was in the commissary department of the Revolution; was in legislature, court of common pleas, representative in congress, was on the corporation of Yale College and died in his 39th year. Later descendants include leading merchants, manufacturers and inventors.

Note the tremendous contrast between these two sets of half brothers—the quiet farmer and the unknown brother of the first mating; the statesman and unstable but magnetic revivalist of the second. The contrast of the product of these two half fraternities is also striking and serves to show the far-reaching consequences of marriage selection.

Since the nature of the mating is of such profound importance for progeny, a knowledge of genealogical history is of the greatest moment in connection with marriage selection. The presence of highly undesirable positive (dominant) racial traits in the family of either one of a pair of young people who are becoming interested in one another should be known to both.

If they marry and have children in the face of the knowledge that at least half of their children will have the same undesirable trait, perhaps their poignant regrets or the sad example will make it easier for some couples in the next generation to mingle some intelligence with their wooing.

In still another respect a knowledge of racial traits may well be of advantage, and that is in the training of a child. Vegetable seedsmen usually send with their seeds directions as to the specific culture of the particular variety. Now, different children have all the racial distinctness of different kinds of cabbages or melons, and it is unwarranted assumption that they all have the same capacities to be educated and that there is a single course of education that is best for them all. The time is coming, we may trust, when a teacher shall begin a class with something more from the registrar's office than the names of his pupils, when it will be recognized that the teacher can train his pupils the more intelligently and effectively the more he knows about the racial qualities as depicted in the family histories of the individuals he is to train.

So, too, in assisting a young person to decide on a vocation it is now recognized as useful to have an analysis of the traits of the person, as far as they have been developed. But the wise adviser will want to go farther and to study the family history of the young man to see if it may not suggest undeveloped potentialities and thus help in a decision as to the kind of life work he should undertake.

Admitting the value of a knowledge of the presence and distribution of racial traits in a family the question remains: What form should genealogy take in the future to furnish the desired information? Since families are merely collections of related individuals, what is needed is, for as many members of the family as possible, a record which should comprise not only the usual statements about birth and marriage and also the biographical and social data so commonly found, but, in addition, and above all, physical and mental data including build, proportions, pigmentation, quality of sense organs and other important physical traits, also the mental equipment, tastes for particular occupations, temperament and social reactions. Because of their importance for advice as to the care of the health, the facts of liability to disease, of grave illnesses and of surgical operations should be given and precise cause or causes of death of those who have died. Those individuals who are willing to give more time to their record will find a detailed *analysis of the personality* an absorbing occupation. Guidance in such an analysis may be obtained from the "Outline of a Study of the Self" by Yerkes and LaRue, also from a "Guide to the Analysis of the Personality," by Drs. August Hoch and George S. Amsden, printed in Bulletin No. 7 of the Eugenics Record Office. It takes several hours to make such an analysis and record; but it has to be done only once in a lifetime and perhaps we owe it to posterity to leave behind us such a record. To encourage the making of such records the Eugenics Record Office, at Cold Spring Harbor, distributes free to applicants a schedule which was based in the first instance on Galton's "Record of Family Faculties" and has undergone three revisions. About 20,000 of these schedules have been distributed to individuals, on request. This fact indicates that there is a widespread interest in this country in making a record of family traits.

It is not sufficient, however, that records be made. In order that such records should be of the greatest service to humanity they should be deposited in a central bureau where they are to be kept as confidential

records, but where they will be available in the biological interests of the human race, for both advice in marriage selection and for studying the inheritance of traits. Such a bureau actually exists in the Eugenics Record Office. The obvious necessity of depositing the family history in a central bureau, if it is to be available for eugenical purposes offers for many an insuperable obstacle. They may enjoy recording facts concerning themselves and other members of their family but they could not think of letting them out of their possession. I can sympathize with this feeling. One does not publish the details of one's family history, because, as society is at present constituted, certain of these facts might, if known, interfere with one's standing or advancement in one's social world. This is owing to the presence of scandalmongers and others of pathological and antisocial instincts who like to hold it up against one that he has certain limitations. The fact that the records are held as confidential ought really to meet this objection. And we may hope that society is nearly ready to take a saner view about one's personal responsibility for one's traits. I am in no way responsible for my racial traits, whether they are due to innate tendencies in development or to peculiar conditions of development, for over neither of these have I, in last analysis, any control. And what a strange spectacle does mankind exhibit, each hiding from others, as far as he can, his personal and family traits, like a lot of little children around a Christmas tree, each hiding from the others the gifts he has received lest it appear that his are not as good as another's. This attitude might be regarded as merely childish and trivial were it not that one's personal and family traits do not belong to oneself, but, in so far as one has, or hopes to have, children and grandchildren, they belong to society. For each one of us is a mosaic of racial traits that have come from a union of various germplasms in the past and some of which will pass into the germplasms of future generations, and organized society has a right to know the racial qualities of its human breeding stock, for organized society is the only agency to which can be entrusted the guardianship of the quality of the germplasm of the future. The scientific genealogy of the future will afford society that knowledge of the racial qualities of its breeding stock. Thus the value of scientific genealogy to humanity lies above all in this that it will make it possible to utilize a knowledge of the racial characters carried by the individual for the advancement of the race.

Chas. B. Davenport
Coldspring Harbor, N. Y.,
December 28, 1914

THE EUGENICS MOVEMENT AS A PUBLIC SERVICE

It is coming to be a commonplace statement that we have paid more attention to the production of high-grade breeds of sheep, cattle, swine, and so forth, than we have to that of effective human beings, and this statement gains popular strength as we awaken one by one to the fact that man is, after all, a member of the animal kingdom and subject to its laws. The idea that society should concern itself directly with the improvement of human offspring emanated, as you well know, from Francis Galton, and the movement thus initiated has for some time been known as the eugenics movement. In clearing the ground by way of preparation for actual work, the eugenist has made certain important discoveries. It appears that in many of our civilized populations to-day, the defective classes are increasing more rapidly than any other constituent of the community and that quite aside from the enormous cost that their care entails