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Geneticists and the Biology of Race Crossing

Geneticists changed their minds about the biological effects of race crossing.

William B. Provine

"Education is to man what manure is to the pea," (*1*) wrote the young geneticist Reginald C. Punnett in 1907. He was obviously keenly aware of the social significance of his work on peas for human affairs. Like many other geneticists then and now, he believed that he should publicize the social implications of his research. In this paper I examine historically only one aspect of the social significance of genetics: the attitude of United States and British geneticists on the topic of race crossing.

Beween 1860 and 1900 Europeans and Americans felt a new urgency about race problems. The Civil War and the freeing of slaves in the United States stimulated a huge outpouring of books and pamphlets about race, in Europe as well as America. Europeans divided up the entire continent of Africa and carved out spheres of imperialistic activity throughout the world, dramatically increasing their contacts with other races. Race-related social problems grew accordingly.

Most whites from Europe and the United States believed these problems resulted from the mental inferiority of nonwhite races. Nineteenth-century biologists concurred. They believed that races of man differed in hereditary physical and mental characteristics, and viewed crossing between distant races with suspicion or outright antagonism (*2*). Specifically, they argued that Negroes were, on an average, mentally inferior to European whites. In 1869 Francis Galton provided a simple quantitative model for the distribution of intelligence within and between populations (*3*). He theorized that the intelligence of Negroes was, on an average, two grades below that of Englishmen, while the intelligence of the "Athenian race" of the Fifth Century B.C. was two grades above that of Englishmen. One of Galton's grades corresponds to approximately ten points on current IQ distributions. Galton based his quantitative analysis of hereditary mental differences between races upon faulty assumptions and scanty evidence. But in the late 19th century his analysis convinced almost all biologists. Galton merely made quantitative what biologists already assumed: that races differed hereditarily in mental traits.

Galton's analysis of racial differences indicated that an intellectually superior race should not breed with an inferior race because a small reduction in average intelligence caused a much greater reduction in the proportion of individuals in the highest grades of intelligence. And, he said, "We know how intimately the course of events is dependent upon the thoughts of a few illustrious men" (*3*, p. 343). Other biologists condemned wide race crosses because some evidence indicated that racial hybrids had weak constitutions, especially if bred among themselves. But the evidence was meager and conflicting. Some anthropologists and political thinkers advocated race amalgamation as the best solution to rising race-related problems. A greater understanding of human heredity seemed

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necessary to resolve the biological merits or demerits of race crossing. Mendelism offered hope.

Early Influence of Mendelism on Ideas of Race Crossing

With the rediscovery of Mendelian heredity in 1900 and the consequent rapid rise of genetics in the early 20th century came a surge of interest in the human implications of the new science. The eugenics movement, defined by Galton as "giving the more suitable races or strains of blood a better chance of prevailing speedily over the less suitable" (*4*), was the most visible manifestation of this interest. By 1910, when the eugenics movement was beginning in earnest, Mendelians were crossing many related varieties of plants and animals, elucidating such previously inscrutable phenomena as dominance, sterility, reversion to ancestral characters, and recombination of traits. Since they believed that humans followed the same laws of inheritance, most Mendelians naturally thought their experimental work was crucial for an objective appraisal of race mixture in humans.

Charles Benedict Davenport was the first geneticist to devote considerable attention to problems of human heredity. His 1911 book, *Heredity in Relation to Eugenics* (*5*), contained almost all that was then known of human genetics. Davenport was also the leading advocate of eugenics in the United States. He was among the first to identify Mendelian characters in man, an obvious preliminary to a rational program of eugenic selection. He believed that such traits as nomadism and criminality were simple Mendelian units. But he admitted that the evidence for these traits was weak, and by 1913 he had published more careful Mendelian analyses of the inheritance of eye color, hair color, and skin pigment in man. American geneticists recognized him as the leading student of human heredity, even if some of his conclusions were questionable.

By 1917 Davenport was convinced that Mendelians could speak intelligently about the genetics of human race crosses. He first published a long article on the inheritance of stature in man (*6*), concluding that many genes controlled stature and that the components of stature could be inherited separately. For instance, he thought that an individual could inherit long arms from one parent and short legs from another. These ideas formed the basis for a second 1917 paper, entitled "The effects of race intermingling" (*7*). Although Davenport realized that accurate scientific data on human race mixture were meager, he believed that certain conclusions could be made by inference from studies on lower organisms. He used the example of hens. Leghorns had been bred to lay eggs, but not to brood. Brahmas, on the other hand, were bred to lay a clutch of eggs and to brood and hatch them before laying more. Leghorns were obviously well suited to chicken farmers who had artificial incubators, and Brahmas to those who did not. When the two breeds were crossed, the hybrid offspring were failures both as egg layers and as brooders. Thus the good qualities of each parent variety were lost in the cross.

Davenport believed that the moral for human races was clear. Each race had, through a long process of natural selection, developed genetic traits that were harmoniously adjusted both with each other and the environment. When two races differing by a number of characters interbred, some new combinations of characters were formed in the hybrids. Mendelian segregation would produce many more new combinations in subsequent offspring of the hybrids. Davenport thought many of these new combinations would be disharmonious, although some would be beneficial. For example, he said that a large, tall race might breed with a small, short one to yield, in the second generation, some offspring with "large frames and inadequate viscera" or "children of short stature with too large circulatory apparatus." Another example was the overcrowding or wide spacing of teeth probably caused by the "union of a large-jawed, large-toothed race and a small-jawed, small-toothed race." Nor were disharmonious combinations confined to physical characters. "One often sees in mulattos an ambition and push combined with intellectual inadequacy which makes the unhappy hybrid dissatisfied with his lot and a nuisance to others." In short, "miscegenation commonly spells disharmony—disharmony of physical, mental and temperamental qualities and this means also disharmony with environment. A hybridized people are a badly put together people and a dissatisfied, restless, ineffective people" (*7*, pp. 366–367). Davenport did not argue in this paper that all race crossing should be stopped in the United States, but that a stringent program of eugenic selection should be instituted. Only people with good new combinations should be allowed to breed. The resulting strains might equal or surpass any other the world had seen.

Davenport carefully avoided condemnation of entire races as inferior. Others had no such hesitancy. In 1918 two young geneticists, Paul Popenoe and Roswell H. Johnson, wrote *Applied Eugenics* (*8*), the most widely used textbook on this subject for more than 15 years. In a chapter entitled "The color line," they suggested that racial antipathy was a biological mechanism to protect races from miscegenation. They also argued that Negroes were inferior to whites. Their evidence was that Negroes had made no original contributions to world civilization; they had never risen much above barbarism in Africa; they did no better when transplanted to Haiti; and they failed to achieve white standards in America. Negroes scored significantly worse than whites on the new IQ tests. Furthermore, the disease resistance of the Negro was inferior to that of the white in North America, although, of course, this relative fitness of the two races was reversed in Africa. Popenoe and Johnson concluded that "the Negro race differs greatly from the white race, mentally as well as physically, and that in many respects it may be said to be inferior, when tested by the requirements of modern civilization and progress, with particular reference to North America." Regarding race crossing between Negroes and whites, they concluded that "in general the white race loses and the Negro gains from miscegenation." Consequently, they felt that they "must unhesitatingly condemn miscegenation" (*8*, pp. 291–292). They recommended legislation to prohibit intermarriage and all sexual intercourse between the two races. *Applied Eugenics* sold well. I can find no evidence that geneticists disapproved of the chapter on race.

Edward Murray East of Harvard's Bussey Institution elaborated the arguments on race mixture advanced by Davenport and Popenoe and Johnson. One of the most highly regarded research geneticists in America, East was among the first to clarify multifactorial Mendelian inheritance. He also was a pioneer in hybrid corn research and an expert on inbreeding and crossbreeding

in general. During World War I the government asked his assistance in agricultural planning; this spurred his interest in the social significance of genetics. When East and his former student Donald F. Jones published *Inbreeding and Outbreeding* (*9*) in 1919, they subtitled it *Their Genetic and Sociological Significance*. The book was a basic contribution to the Mendelian interpretation of breeding, and its significance was recognized by all experimental geneticists.

The last two chapters of *Inbreeding and Outbreeding*, written by East alone, dealt with the sociological significance of genetics, particularly the problems of race mixture. East divided race mixture into two kinds, those between closely related races and those between distantly related races. The former, as between various white races of Europe, had produced the most civilized humans. But East cited two genetic objections to wide human race crosses, as between Negroes and whites. First, Mendelian segregation would "break apart those compatible physical and mental qualities which have established a smoothly operating whole in each race by hundreds of generations of natural selection." Second, it was "an unnecessary accompaniment to humane treatment, an illogical extension of altruism . . . to seek to elevate the black race at the cost of lowering the white" because "in reality the negro is inferior to the white. This is not hypothesis or supposition; it is a crude statement of actual fact" (*9*, pp. 253–254).

Geneticists reacted favorably, at least in print, to this double-barreled view of race crossing. Raymond Pearl reviewed *Inbreeding and Outbreeding* for *Science* (*10*). Pearl, who later boasted of his opposition to "Nordic enthusiasts," wrote that the last two chapters might "fairly be regarded as among the sanest and most cogent arguments for the integral incorporation of eugenic ideas and ideals into the conduct of social and political affairs of life. . . . There is a refreshing absence of blind and blatant propaganda" (*10*). Many geneticists simply stuck to their work on lower organisms and did not generalize to humans. But those who did express an opinion agreed with one or more of the reasons advanced by East and Davenport against wide race crossing. Published opposition from geneticists and other biologists to these arguments on race crossing was nonexistent before 1924.

Harmonic and Disharmonic Race Crossings

In 1921 most of the well-known geneticists in Europe and America attended the second international congress of eugenics in New York City. There were many papers on race mixture. The one that attracted most attention was entitled "Harmonic and disharmonic race-crossings" (*11*), by Jon Alfred Mjoen, a Norwegian biologist.

Mjoen argued, as had Davenport, that "single qualities" dominated in the crossings of races of animals, and that these separate units were inherited undiluted. Thus, "disharmonic" combinations of these single qualities were possible through Mendelian recombination. Mjoen presented data indicating that crosses between Lapps and Nordics in Norway produced disharmonic offspring. The hybrids exhibited mental imbalance, including criminality, feeblemindedness, and unwillingness to work. They suffered higher rates of tuberculosis and other diseases, which indicated physical disharmony. Mjoen also presented evidence from his experiments on crossing varieties of rabbits. Individuals from later generations of the hybrids showed lack of physical vigor and, in some cases, one upright and one pendant ear, a "symptom of disharmony in general" (*11*, p. 57). Mjoen believed the rabbit crosses indicated the problems to be encountered in human crosses. He denied any race prejudice, but closed his paper with an impassioned plea for restraint in mingling disparate races. The papers from the congress were published in 1923. Soon other authors began to cite Mjoen's paper with approval (*12*).

Now for the first time a geneticist spoke out clearly against the theory of disharmonious race crosses advanced by Davenport, East, and Mjoen. William Ernest Castle, a colleague of East's at the Bussey Institution, prepared a reply to Mjoen. Castle had a knack for getting into heated public controversies and then having to back down from his position. In 1906 he had advocated the mutation theory of Hugo de Vries, only to change to a selection theory of evolution by 1911. At that time he believed that selection could change Mendelian factors themselves. This belief was a heresy in the thinking of most Mendelians. Castle vigorously waged this battle in the journals until 1919, when he published a retraction. Castle's criticisms certainly stimulated important research, but his colleagues did not forget his record of controversy and retraction. In 1924 Castle was advocating another heresy. He was arguing that the factors that determine size, at least in mammals, were general factors affecting all parts of the skeleton simultaneously. Davenport, Mjoen, and most other Mendelians supported the conflicting view that special factors that could be separately inherited controlled the size of individual bones.

In his reply to Mjoen, Castle (*13*) challenged the basic thesis that skeletal parts and organs were controlled by specific size factors. Because of general size factors, Castle argued, disharmonies in race crossing were not to be expected. His own numerous experiments on crosses of rabbits had revealed no disharmonies. Mjoen's "disharmonies" in rabbits and humans were simply his value judgments and not biologically detrimental. In humans, "most inherited characters are blending," so the observed consequences of race crossing should not be deterioration, "but rather an intermediate degree of the characters involved." Examining data on crosses between African black races and European whites, American Indians and whites, and Lapps and Nordics, Castle concluded that the data supported his theory, not Mjoen's. Castle freely admitted, however, that African blacks had less native intelligence than whites, that mulattos were intermediate in intelligence, and that race crossing might legitimately be opposed for social reasons. But "so far as biological considerations are concerned, there is no race problem in the United States" (*13*, p. 366).

So Castle, like East, believed that Negroes had on an average less intelligence than whites, and that mulattos had intermediate intelligence. East, following Galton's reasoning, used these supposed facts to argue that whites would lose a sizable percentage of their most intelligent people by crossing with blacks, too great a price to pay. Castle used the same facts to argue that in crossing, blacks were raised as much as whites were lowered, so biologically the crosses were neutral.

The amount of genetic evidence about human race crossing was minimal during the mid-1920's. In 1924 Samuel J. Holmes, professor of biology at the University of California, published an extensive bibliography of eugenics (*14*), one section of which was entitled "Race mixture and the intermarriage of dif-

ferent stocks." Although he placed 209 entries in this section, he commented, I think accurately (*14*, p. 465):

> A much fuller list than I have compiled might have been made on the subject of race mixture, but it would probably be of little value. Even most of the references I have cited contain little of really substantial merit in relation to this subject. . . . The problem of race mixture is one we have scarcely begun to attack in the careful, systematic, and scientific manner which alone can produce results of value.

In 1929 Davenport and his assistant, Morris Steggerda, published a substantial study entitled *Race Crossing in Jamaica* (*15*), which they hoped would relieve this dearth of hard data. The bulk of the study concerned the physical characteristics of blacks, browns (mulattos), and whites in Jamaica. The authors found that, with respect to a particular character, if blacks and whites differed considerably, the browns tended to be more variable than either parent race. They attributed this extra variability to Mendelian segregation. In only one case, however, did they point to a disharmonious physical result of the crosses. Some browns had "the long legs of the Negro and the short arms of the white, which would put them at a disadvantage in picking up things off the ground." Davenport and Steggerda did not emphasize this slight physical disharmony; they concluded that "physically there is little to choose between the three groups" (*16*, pp. 237–238). They thought the greatest disharmonies were in the mental traits of the hybrids. This was expected on Mendelian grounds because Jamaican blacks and whites differed considerably on tests of these traits. The performance of the browns was, on an average, better than that of the blacks, but some browns performed excellently while others performed miserably. Davenport and Steggerda concluded that if society could select the best half of the hybrids, as breeders did with cows or chickens, the cross of blacks and whites would be beneficial. But this was unfeasible, so they opposed race mixture because of the large percentage of intellectually incompetent persons produced.

Herbert Spencer Jennings was among the first to use the results of the widely read study of Davenport and Steggerda. Jennings had achieved prominence in the early 1900's through his work on the behavior of lower organisms, and he was a highly respected geneticist. A political liberal, he had vigorously attacked the eugenics movement for its hereditarian bias. But Jennings took Davenport's conclusions seriously as he showed in his 1930 book, *The Biological Basis of Human Nature* (*17*). He began his chapter on race mixture with a careful Mendelian analysis, which included a drawing of a large dog with short legs, its sternum nearly touching the ground. The dog's parents were a Saint Bernard and a dachshund. If such disharmonious combinations could be obtained from crossing dogs, Jennings suggested, similar results could be expected in human crosses. In support of his theory Jennings repeated Davenport's conclusions about the physical and mental disharmonies of the hybrid Jamaicans.

William Castle was thoroughly annoyed with this rejuvenation of the spectre of disharmonious race crossings. He prepared a rebuttal for *Science* (*18*). The hybrid dog, he said, was no more ridiculous-looking than the dachshund itself. Castle accurately asserted that there was a "complete vacuum of evidence" for disharmonies of body organs and body size, hypothetically predicted by Jennings and Davenport. As for the disharmonious Jamaican browns with the long legs of the Negro and the short arms of the whites, Castle calculated from the data that the disadvantage was 1 centimeter of reach at most. Davenport had not been specific about the size of this disharmony in his conclusions. Castle concluded with a remark often quoted by opponents of "scientific racism" (*18*, p. 605):

> We like to think of the Negro as an inferior. We like to think of Negro-white crosses as a degradation of the white race. We look for evidence in support of the idea and try to persuade ourselves that we have found it even when the resemblance is very slight. The honestly made records of Davenport and Steggerda tell a very different story about hybrid Jamaicans from that which Davenport and Jennings tell about them in broad sweeping statements. The former will never reach the ears of eugenics propagandists and Congressional committees; the latter will be with us as the bogey men of pure-race enthusiasts for the next hundred years.

Davenport immediately wrote to Jennings to ask whether they should reply to Castle. Jennings answered (*19*):

> My inclination is rather to ignore Castle's outbreak, so far as my book is concerned. As you indicate, he is very much given to sudden outbursts of this sort, and at such times he has a genius for missing the point. I don't know of anyone that approaches him in the number of embittered controversies he has had, in which he ultimately admits that he was wrong. . . . What could one say, without seeming unfriendly, about his assumption and assertion that the reason you and I take the position we do on this matter is because we hold the negro to be inferior and want to prevent intercrossing? How shall we ever have any knowledge on such a matter if it not be made the object of investigation?

Davenport did reply to Castle in *Science* (*20*). He argued that Castle's belief in general size factors determined his reaction to *Race Crossing in Jamaica*, and Davenport challenged that belief. He further declared that he and Steggerda never claimed that browns were a degradation of the white race. He could not, however, reply to Castle's damaging observation about the 1-cm disharmony in the reach of some browns.

Castle was again playing the role of a maverick. In 1924 he had been the first geneticist to speak out against the race theories of Mjoen and Davenport; in 1930 he was continuing the argument with minimal published support from other geneticists. Many of them doubted Castle's faith in the general size factors that were the basis of his genetic argument against the possibility of disharmonious combinations in disparate human race crosses. Jennings, Davenport, and East clearly expected that Castle would eventually have to recant on this issue as he had in earlier episodes.

Jennings, Davenport, and East believed they were being purely objective scientists in their concern about race mixture in humans. All three were staunch supporters of civil liberties for every individual. East was thoroughly indignant about discrimination against Negroes on trains and in theatres and restaurants. He exclaimed that such discriminatory actions were "the gaucheries of a provincial people, on a par with the guffaws of a troop of yokels who see a well-dressed man for the first time" (*21*). Davenport and Jennings would have agreed. But all three believed that objective science must be heeded, and, in their view, the biological facts were that wide race crosses in humans were probably harmful.

Race Crossing in Jamaica by Davenport and Steggerda marked the end of geneticists' attempts to emphasize obvious physical disharmonies in race crossing. The book was thoroughly discredited in a review by Karl Pearson (*22*). He pointed out that the sample sizes used by Davenport and Steggerda

were too small to bear the weight of their conclusions, and that their selection of subjects was suspect. Pearson made clear the magnitude of the difficulty of conducting experiments necessary to reveal disharmonies in race crossings. Furthermore, other studies of race crossings published by geneticists and anthropologists in the late 1920's revealed no significant physical disharmonies. The most important of these studies were by Leslie C. Dunn and A. M. Tozzer on race crossing in Hawaii (*23*), by R. Ruggles Gates on Amerindian crosses in Canada (*24*), by H. L. Shapiro on the descendants from the *Bounty* on Pitcairn Island (*25*), and by Melville Herskovits on Negro-white crosses in the United States (*26*).

As the question of obvious physical disharmonies in race mixture disappeared in the early 1930's, some geneticists began to emphasize the more subtle problems of mental and physical disharmonies in race crossing. In 1931 Jon Alfred Mjoen published an article in *Eugenics Review* entitled "Race-crossing and glands" (*27*). He repeated his earlier arguments, buttressed by the following new one: The physical and psychic well-being of the human body is dependent upon the functioning of the endocrine glands; these glands are in turn "dependent upon different genes"; therefore, race crossing may lead to disharmoniously correlated endocrine systems that could cause physical disturbance. Mjoen cited evidence indicating higher rates of diabetes, cretinism, and absence of disease resistance in crosses between Nordics and Lapps in Norway.

The most significant experimental support for Mjoen's glandular theory came from Charles R. Stockard's work on crossing breeds of dogs (*28*). All 78 of his first-generation hybrids between Saint Bernards and Great Danes developed a strange paralysis of the hind legs. In second-generation hybrids physical and mental traits were combined in new ways, some of which Stockard believed were disharmonious. He studied especially the recombination of structures affected by achondroplasia, acromegaly, and microcephaly; all were known to be under glandular control. Thus, Stockard's experiments appeared to support Mjoen's hypothesis. Further support for Mjoen's general hypothesis appeared in 1931 with the English translation of the third edition of the human genetics textbook by Eugen Fischer, Erwin Baur, and Fritz Lenz (*29*). Raymond Pearl, reviewing the 1928 German edition, had lamented: "It is a pity that we have in English no such sound, comprehensive, and stimulating work as this on human heredity" (*30*). The book immediately became the standard work on human heredity in England and America, as well as in Germany. The authors pointed out clearly the dangers of mental disharmony in disparate race crosses. In his section Lenz, for example, commented that "the crossing of Teutons and Jew is likely, as a rule, to have an unfavourable effect, for it will impair the peculiar excellences of both types" (*29*, p. 639).

Thus, in 1931, although the issue of gross physical disharmonies was disappearing, fear of glandular and mental disharmonies still caused some geneticists to believe that race mixture was detrimental.

From Condemnation to Agnosticism

In the mid-1930's, geneticists' published statements about the effects of race crossing changed from condemnation to agnosticism. In part this change came from biological evidence. In the late 1920's and early 1930's geneticists experienced a growing realization that human heredity was more complex than they had previously thought. Thus they became more hesitant to make positive statements about hereditary race differences and the effects of race crossing. Also, some evidence collected or compiled by physical anthropologists Melville Herskovits (*31*) in the United States and J. C. Trevor (*32*) in England indicated that hybrid populations had no more variability than did the pure parent races. The evidence for this conclusion was suggestive, but hardly convincing, because accurate measurements of the parent races were generally unavailable and because the "hybrids" exhibited all degrees of race mixture. Herskovits claimed his findings were incompatible with Mendelian heredity because one should expect more, not less, variability in the hybrids. Geneticist H. J. Muller (*33*) responded by arguing that even if Herskovits' dubious data were reliable, at least two Mendelian hypotheses could account for the apparently anomalous result. On both hypotheses, Muller said, few disharmonies should be expected from race crossing. But Muller's paper was basically no more than a very theoretical exercise.

More important than new biological evidence as a factor prompting geneticists to publicly reevaluate their theories of race mixture was the application of Nazi race doctrines before World War II. The Nazi doctrines resembled those of Madison Grant, who had declared that "the cross between any of the three European races and a Jew is a Jew" (*34*). Recognizing the German threat to personal liberty and to the world, some geneticists and anthropologists published popular books and articles debunking Nazi propaganda. *We Europeans* (*35*), published in 1936 by Julian Huxley and A. C. Haddon, and *Heredity and Politics* (*36*), published in 1938 by J. B. S. Haldane, were perhaps the two most significant examples. Both Huxley and Haldane attacked Nazi race doctrines with vigor, but they stopped short of denying hereditary mental differences or condoning all racial intermingling. The genetic evidence about race mixture was simply nonexistent, they said, and that situation should be remedied. Haldane wrote (*36*, pp. 184–185):

> I would urge the extraordinary importance of a scientific study of the effects of racial crossing for the future of the British Commonwealth. Until such a study has been accomplished, and it is a study that will take generations to complete, we are not, I think, justified in any dogmatism as to the effect of racial crossing. . . . I am sure that the fact of our ignorance is a deplorable one which we ought to remedy.

Huxley's view was similar. In a letter to the editor of *Eugenics Review* he stated (*37*):

> In human genetics, the most important immediate problem is to my mind that of "race crossing.". . . The question whether certain race crosses produce "disharmonious" results needs more adequate exploration. Social implications must also be borne in mind in considering this subject.

Haldane and Huxley concluded accurately that the evidence was inadequate to assess the biological results of race mixture. Geneticists had previously found their greatest successes by applying Mendel's method of careful pedigree analysis, but they had no statistically significant data from similar analyses of wide human race crosses. Without this data no one could accurately assess disharmonies or disruption of smoothly working gene complexes in race crosses. Recognizing this, both Haldane and Huxley advocated immediate further study of race mixture. Their views indicate a significant shift in genetics literature since the pub-

lication of *Inbreeding and Outbreeding* in 1919. At that time East had argued without opposition that genetics showed wide race crosses in humans to be bad. By 1939 most geneticists, like Haldane and Huxley, were taking an agnostic position.

From Agnosticism to Certitude

During and shortly after World War II, biologists and anthropologists published many books attacking Nazi race theories and racism in general. Most of these books exhibited a further change in attitude. They declared that race crossing was sometimes biologically favorable, but never detrimental. The new orthodoxy was well represented in 1946 by Leslie C. Dunn and Theodosius Dobzhansky in their little book *Heredity, Race, and Society* (*38*). They intended the book to give the layperson a precise description of human genetics. Their opinion on race mixture was clearly stated and at the time widely accepted (*38*, p. 114):

> Contrary to opinion vociferously expressed by some sincere but misguided people, . . . a trend [toward race fusion] is not biologically dangerous. Mixing of closely related races may even lead to increased vigor. As for the most distantly separated races, there is no basis in fact to think that either biological stimulation or deterioration follows crossing. The widespread belief that human race hybrids are inferior to both of their parents and somehow constitutionally unbalanced must be counted among the superstitions.

To the public this statement by Dunn and Dobzhansky represented a significant change of view from that expressed by Haldane and Huxley in 1938. Race crossing now appeared to involve no biological danger. But the scientific evidence on race crossing had not changed significantly between 1938 and 1946. There simply was not a decisive study on race crossing during that time.

Another important book on human genetics appeared in 1946. *Human Genetics*, by R. Ruggles Gates (*39*), was 1518 pages long and contained a summary of almost all the work in the field. Gates believed that wide race crosses could produce disharmonious results; he gave a few examples from the work of others and commented that "the existence of such conditions in crosses has frequently been denied" (*39*, p. 1358). Although *Human Genetics* became a standard reference, it was published too late for most human geneticists in the United States or England to take its views on race crossing seriously. Three years later, Curt Stern published the first substantial classroom textbook on human genetics (*40*). He considered it at least "conceivable that different parts of the body may sometimes be genetically determined in a sufficiently independent manner so that actual incongruities may arise" (*40*, p. 569) in race crosses. Even this agnostic view would almost disappear during the early 1950's.

The Unesco Statement on Race

An examination of the 1951 Statement on Race by the United Nations Educational, Scientific, and Cultural Organization (Unesco) indicates clearly that the view of Dunn and Dobzhansky on race crossing was widespread among geneticists by that time. But before turning to the Unesco statement, I should emphasize that many geneticists were reluctant to formulate or sign such a statement before the war. For example, Franz Boas wrote to Raymond Pearl in October 1935, requesting him to formulate a statement on race. It was hoped that the statement, to be signed by prominent anthropologists and biologists and then circulated around the world, would counteract Nazi propaganda on race. Pearl responded by agreeing with Boas that the philosophy of the Nordic enthusiasts was "wholly absurd, unscientific, and in the highest degree mischievous." But he went on to say (*41*):

> Holding these views I think fully as strongly as you do, I nevertheless venture to question the wisdom and strategy of taking the action you suggest in your letter. . . . I have a strong aversion to round-robins by scientific men, and most particularly where the pronouncement is really, however camouflaged, about political questions or angles of political questions which have more or less relation to purely scientific matters. In my observation such round-robins never do any good in correcting an evil they are supposed or intended to correct, and, furthermore, in my observation they always do harm to the scientific men who sign them and through these men to science itself. . . . I am unalterably opposed now and all times towards any attitude of pontifical authoritarianism under the aegis of science.

By 1939 some geneticists had become more concerned, and at the Seventh International Genetics Congress they formulated the "geneticist's manifesto" (*42*) on the future improvement of human populations. The manifesto, nine paragraphs long, rejected Nazi-like race theories in only two sentences, and no attempt was made to formalize or widely publicize this document as a statement on race. After the war, of course, geneticists were more willing to formulate and sign a formal statement on race.

In 1949 Unesco resolved to collect scientific materials on race and to publicize a statement concerning them, with the stated object of combatting racism. A committee of anthropologists and sociologists, chaired by Ashley Montagu, drew up the first statement on race (*43*), and it was issued to the world on 18 July 1950. Many geneticists and physical anthropologists, however, believed the statement was unscientific because it contained assertions such as (*43*, p. 93): "Biological studies lend support to the ethic of universal brotherhood; for man is born with drives toward co-operation, and unless those drives are satisfied, men and nations alike fall ill."

Because many scientists were dissatisfied with the statement, Unesco officials arranged to issue a second statement on race by geneticists and physical anthropologists. Haldane and Huxley, both of whom had been firm agnostics on the biological consequences of race crossing in the late 1930's, were members of the committee which issued the second statement in 1951. This statement conflicted directly with the two arguments against race crossing which Edward Murray East raised in 1919. East argued that Mendelian segregation following wide race crosses would produce disharmonious results. The statement read (*43*, p. 15):

> As there is no reliable evidence that disadvantageous effects are produced thereby, no biological justification exists for prohibiting intermarriage between persons of different races.

East also had argued that the Negro was mentally inferior to the white. The statement said (*43*, p. 15–16):

> Available scientific knowledge provides no basis for believing that the groups of mankind differ in their innate capacity for intellectual and emotional development.

These sentences were judiciously worded. Although stated in the negative, they conveyed the impression that biological science showed (i) that race crossing was at worst biologically neutral, and (ii) that races were alike in hereditary mental traits.

The Unesco statement was sent to 106 prominent physical anthropologists

and geneticists. Of the 80 who responded, 23 accepted the statement in its published form, and 26 agreed with its tenor but disagreed on particulars. The others had substantial criticisms. Many geneticists objected most to point (ii) above. Muller's comments represented the thrust of the objections (*43*, p. 49):

> In view of the admitted existence of some physically expressed hereditary differences of a conspicuous nature, between the averages or the medians of the races, it would be strange if there were not also some hereditary differences affecting the mental characteristics which develop in a given environment, between these averages or medians.

Muller added that he was convinced most geneticists agreed with him, even those who signed the statement outright.

The statement's assertion that race mixture was harmless received very little criticism, however. Only A. H. Sturtevant questioned the validity of the assertion. Joseph Needham wanted to know why the statement had failed to tell the world that "race mixture is positively advantageous, rather than not disadvantageous" (*43*, p. 65). It is true that in the next 2 years Gates and C. D. Darlington publicly criticized the statement's position on race crossing; both were dismissed as radical hereditarians by most human geneticists in the United States and England. Thus the 1951 Unesco statement marks a clear point at which the public attitude of geneticists on the issue of race crossing had reached the current dominant view: that race crossing is at worst harmless.

Summary and Conclusions

Geneticists in England and the United States clearly reversed their published remarks on the effects of race crossing between 1930 and 1950. The reversal occurred in two steps. First came the change in the 1930's from a condemnation of wide race crosses to an agnostic view. The second change, from the agnostic view to the belief that wide race crosses were at worst biologically harmless, took place during and shortly after World War II.

The entire reversal occurred in the light of little new compelling data from studies of actual human race crosses. The lack of new data is unsurprising. Few geneticists wished to initiate experiments that took three human generations to complete. And controlled race crosses are hard to arrange, even with government grants. What might be more surprising was the willingness of geneticists to make such positive statements about race crossing when they had so little reliable genetic evidence.

I interviewed or wrote to ten prominent geneticists who worked on human genetics between 1930 and 1950. Not one believed that new evidence on race crossing was the primary reason why geneticists changed their minds about the effects of race crossing. One plausible explanation, that the rise of "population thinking" (*44*) caused geneticists to change their minds, does not fit the evidence. Castle was no more of a "population" thinker than East, yet they differed radically in their conclusions about race crossing. What, then, did cause geneticists to change their minds?

Most important was the revulsion of educated people in the United States and England to Nazi race doctrines and their use in justifying extermination of Jews. Few geneticists wanted to argue, as had the Nazis, that biology showed race crossing was harmful. Instead, having witnessed the horrible toll, geneticists naturally wanted to argue that biology showed race crossing was at worst harmless. No racist nation could misuse that conclusion. And geneticists did revise their biology to fit their feelings of revulsion.

Geneticists' ideas about the related question of hereditary mental differences between races is perhaps undergoing a similar development to that seen earlier in their ideas about race crossing. In 1951, judging from the response to the Unesco second statement on race and comments in genetics literature, most geneticists agreed with Muller that races probably differed in significant average mental traits. By 1969, when Arthur Jensen advocated this view in his controversial article (*45*), most geneticists who spoke publicly on the issue had adopted an agnostic position. Knowledge of hereditary racial differences in IQ had scarcely changed since 1951, but society had changed considerably in racial attitudes. It will be interesting to see if during the next several decades geneticists will argue, on the basis of little additional evidence, that hereditary mental differences between races do not exist.

I am not condemning geneticists because social and political factors have influenced their scientific conclusions about race crossing and race differences. It is necessary and natural that changing social attitudes will influence areas of biology where little is known and the conclusions are possibly socially explosive. The real danger is not that biology changes with society, but that the public expects biology to provide the objective truth apart from social influences. Geneticists and the public should realize that the science of genetics is often closely intertwined with social attitudes and political considerations.

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