

might be represented in its board of directors. The great fear would be that such an institution would fall into the control of one or another of the big financial groups of the country. For instance, the Morgan group would insist upon being represented in it; the Standard Oil group would want a representative in it; the Harriman group would want a representative in it, and so on. And perhaps one or another of these powers would be able to secure predominance in its management.

The most serious question that can be raised in regard to a central bank is whether we possess the financial ability to manage such an institution. Financial ability we have in abundance, but what would be needed is great financial ability independent of private interests and speculative enterprises. If we have not such ability now, such an institution would quickly develop it.

One of the first things that Alexander Hamilton did for the United States of America was to establish a central bank. One of the most unfortunate events in American history was the destruction of the second United States bank by Andrew Jackson, who admitted that he was opposed to all banks, having become prejudiced against them by reading the history of the South Sea Bubble. And much of the prejudice felt by Jackson and transmitted by

him to a great party in this country still remains. Whether or not it can be overcome is a question for the future to answer.

In conclusion, let me urge that something be done immediately in the way of providing for an issue of currency for use in financial emergencies, not in the expectation that it will always prevent panic or business depression but that it will be ordinarily a breakwater against disaster and will provide for a larger degree of stability in interest rates. The thing to do is to take advantage of the recent panic, with its impressive object-lesson of the need of such an emergency circulation, and get together. Any legislation that can be secured on this subject must be in the nature of a compromise. That compromise will be along the line of least resistance. The line of least resistance lies in the creation of a possible note issue which shall be in harmony with our present system and which will satisfy the people that it is not a creation primarily for the profit of issuing banks, but for the protection of the country.

The larger and more scientific reform might be left for a commission of experts to investigate and report on. Properly conducted, such an investigation would, it is likely, make the most important contribution to constructive finance in half a century.

BREEDING BETTER MEN

THE NEW SCIENCE OF EUGENICS WHICH WOULD ELEVATE THE RACE BY PRODUCING HIGHER TYPES

BY

RAYMOND PEARL,

BIOLOGIST OF THE MAINE AGRICULTURAL EXPERIMENT STATION

THE actual creation of new and better types of plants and animals has become almost a matter of everyday occurrence. Indeed, the time is rapidly approaching when it will be possible for a person to give an order to a breeder specifying that he would like to have a plant or an animal embodying such and such characteristics, and, after a due lapse of time, to receive from the breeder precisely what he ordered, just as though he were dealing with a manufacturing machinist. Now, while this possibility, even at present in sight of complete realization, represents a truly wonderful advance in man's

ability to control nature, yet it leaves practically untouched what is after all the greatest problem of applied biology. For it is certainly clear that, from the human standpoint, whether individual or social, nothing compares in importance with the amelioration of man himself.

If we consider that social movement which we commonly call "the advance of civilization," we see that society, acting principally through both Church and State, has continuously endeavored to make man better. But this endeavor has mainly taken two directions: one through the improvement of the external

conditions of human existence, including the combating of the various things which cause disease; the other through education in the broadest sense, including moral education from the Church. It is obvious that the progress in both directions has been enormous. Clearly, however, both these lines of endeavor, successful as they have been in their respective fields, have not touched one possibility for the amelioration of the human species. They have had to do, on the one hand with man's environment, and on the other hand with his development and life after birth, and have nothing directly or effectively to do with his character or quality *at* birth. In other words, the case has been very similar to earlier agricultural practice, where almost the entire attention was given to the cultivation of crops, their fertilizing, the tillage of the soil, and the like; and little or no attention was given to the procuring of better seed on which to practice improved cultivation. But agriculture is now passing beyond this stage; the breeding of better varieties of plants and animals is now universally recognized as the direction in which the greatest agricultural advance of the future is likely to come.

But if this be a good way in which to improve animals and plants in general, is it not worth considering in connection with the problem of the betterment of the human race? A firm conviction that in this idea lies so much promise of future advance in the welfare of nations and that a thorough-going scientific investigation of the problem of human breeding in the widest sense is imperatively demanded, led to the new science of eugenics.

A SCIENCE OF HUMAN BREEDING

What, then, is the "science of eugenics," who are its workers, and what has it accomplished? We may best define it by paraphrasing the definition given by its founder, Mr. Francis Galton. Eugenics is the science which deals with all influences that improve the inborn qualities of a race, also with those that develop them to the utmost advantage; and it embodies the study of agencies under social control that may improve or impair the racial qualities of future generations. The primary and immediate aim of the science is thoroughly to investigate:

(1) The laws of variation, and particularly of inheritance, of physical and psychical characters and of the various specific diseases

and general morbid conditions to which man is subject, in order that it may be known to what extent these various characters are inborn.

(2) The relative fecundity and fertility of the various racial and social classes, and the correlation or association of fecundity and fertility with different characteristics, in order that we may know to what relative extent the good, bad, and indifferent elements of society reproduce themselves.

(3) The effect of external influences on the characteristics enumerated under (1) and (2), in order that definite knowledge as to how such social activities as organized charities, for example, may most effectively be directed toward a eugenic end.

A parallel aim is to endeavor to influence public opinion toward eugenic ideals, particularly with reference to marriage, the bearing and rearing of children, and to the care and treatment of defective classes of society; using as the basis for the propaganda the solid contributions to knowledge which may be gained in the campaign of research outlined.

As has been said, the eugenics movement owes its origin to Francis Galton. It was formally inaugurated, and the science received its name, in a paper read by Mr. Galton before the Sociological Society of London early in 1904. But while the formal inauguration of the movement dates from this time, a solid foundation for it had been laid by earlier work, particularly that of Mr. Galton on inheritance, embodied in his widely read "Hereditary Genius" and "Natural Inheritance"; and that of Professor Karl Pearson in mathematical biology, or "biometry." To the genius of Professor Pearson the science of eugenics is indebted for that development of refined methods of statistical analysis which may fairly be said to have been the *sine qua non* of all that eugenics has so far accomplished. In 1905 Mr. Galton gave to the University of London a sum of money for the purpose of establishing work in eugenics as a part of research activity of the University. A "Francis Galton Research Fellowship in Natural Eugenics" was founded and a Fellow appointed. Recently an addition to the endowment has been made by Mr. Galton, and at present the work is a regular department of the University, carried on under the direction of Professor Pearson by a corps of assistants.

Def. of
Eugenics

In considering the results which have so far been obtained by workers in eugenics, we may best take up in order some of the most important specific questions to which they have obtained definite answers.

The first of these questions is: Are the physical characters of man inherited, and, if so, with what intensity in the different degrees of relationship? To answer this question it is obviously necessary to measure precisely in a large number of individuals of certain degrees of relationship a series of definite physical characters, and then to get an expression of the degree to which a given characteristic in sons, say, is like that characteristic in fathers.

The best expression for this likeness has been found to be a mathematical constant known as the coefficient of correlation. A word will suffice to explain the nature of this constant; it is of such character that if every son in a measured group were precisely like his father in respect to the character measured, the coefficient measuring the resemblance would take the value one. If, on the other hand, the group of sons were no more like their fathers than they were like any group of men in general, the coefficient would take the value of zero. For degrees of resemblance between total absence of likeness and absolute identity, the coefficient will take the appropriate value between zero and one.

To answer the question whether physical characters are inherited in man, Professor Pearson and his head-assistant, Dr. Alice Lee, collected an extensive series of data from middle-class English families. The data included measurements of stature, and length of the forearm and span, taken for the following relations in about one thousand families: father, mother, adult sons, adult daughters. These investigators also obtained data on the color of the eyes for individuals of the same degrees of kinship. The general character of the results of the analysis of these is as follows:

CHARACTER	RELATIVES	INTENSITY OF RESEMBLANCE AS MEASURED BY THE COEFFICIENT OF CORRELATION.
Stature,	Father and son	.51
Span,	" " "	.45
Forearm length,	" " "	.42
Eye color,	" " "	.55
Stature,	Mother and daughter	.51
Span,	" " "	.45
Forearm length,	" " "	.42

From these results there can be but one conclusion. It is that the characters measured

are definitely inherited and to a sensible degree. The resemblance between parent and offspring is on the average about one-half as close as complete identity. A similar result is reached if we examine other kinds of relationship. Thus, if the degree of resemblance between brothers be measured, the following results are obtained:

CHARACTER	RELATIVES	INTENSITY OF RESEMBLANCE
Stature,	Adult brothers	.51
Span,	" " "	.55
Forearm length,	" " "	.49
Eye color,	" " "	.52
Head length,	Minor brothers (12 years old)	.50
" breadth,	" " "	.59
" height,	" " "	.55

We see that again a very definite degree of hereditary resemblance is shown. The same thing would appear if we dealt with comparable statistics for sisters. An interesting point further comes out of these tables. If we take the average of the intensities of parental resemblance in the first table, we find it to be .47. The average intensity of the resemblance between brothers from the second table is .53 — larger than the former. We should get the same result if we took more extensive data, and it leads to one of the well-grounded conclusions of eugenics work — that the hereditary resemblance between brothers and sisters is, on the average, closer than that between parent and offspring.

The hereditary resemblance between an individual and his more remote ancestors, in respect to physical characters, has been measured in the same way. The general result of such studies has been to lead to the formulation of a definite law of inheritance, the so-called law of "ancestral inheritance." This may be expressed as follows: An individual inherits in some degree from every one of his ancestors, however remote; but the degree of intensity of this inheritance diminishes very rapidly (in geometrical progression) as we pass to more remote ancestors. This law of inheritance has now been shown to hold not only for man, but for a number of lower organisms. It was first formulated by Mr. Francis Galton.

Having settled the question that the physical characters of men are inherited, the next problem obviously is: Are mental and moral qualities likewise inherited, and if so with what degree of intensity? In order to get an answer to this problem Professor Pearson spent several years in the collection and reduction of data on the degree of resemblance between brothers

and sisters in respect to a whole series of psychical characters. These characters included such things as "ability," "temper" "vivacity," "assertiveness," "conscientiousness," and other similar attributes.

The first work was with school-children, the records being made by teachers. It might appear at first thought that such characters could not be treated metrically because no one of them can be measured in the individual with absolute accuracy. But such is far from being the case. Developments of higher statistical theory make it possible to treat data of this kind with quantitative precision. Without going into details regarding this investigation, its general results may be stated as follows: The coefficients measuring the resemblance between brothers and sisters in respect to eight psychical characteristics studied were found to take values substantially identical with those found for the coefficients measuring the resemblance between the same individuals in regard to a series of physical characters. In other words, the evidence indicates that mental and moral characters are inherited, and with about the same degree of intensity as physical characters. Recently another investigator, Mr. Schuster, has shown from a study of Oxford class-lists that the degree of resemblance between father and son, and between adult brothers, in intellectual ability as measured by university scholarship is substantially the same as the resemblance in physical characters between such relatives.

THE INHERITANCE OF DISEASE

Are specific diseases and pathological conditions generally inherited, and with what intensity? The workers in eugenics find that some pathological conditions, at least, are inherited, and with about the same intensity as physical, mental, and moral characters are. The following tabular *résumé* indicates what has so far been done in this field:

PATHOLOGICAL CONDITION	COEFFICIENT MEASURING PARENTAL RESEMBLANCE	COEFFICIENT MEASURING FRATERNAL RESEMBLANCE
Deaf-mutism	.54	.73
Insanity	.58	.48
Pulmonary tuberculosis	.50	.48
Average	.54	.56

Altogether, the eugenics work which has been done can fairly be said to have laid the solid foundation of a knowledge of the laws of heredity in man. All the broad categories of human characteristics — normal physical, psychical, and pathological — have been in-

vestigated and, to a first approximation, a knowledge has been obtained as to how they are inherited. Such knowledge was the primary, fundamental need of any scientific eugenics movement, and to have attained so much of it as investigators have is a distinct and notable achievement.

A REPRODUCTION OF THE FITTEST

But heredity is not the only phase of eugenics which has been investigated. Knowing definitely how human characteristics are inherited, it is of equal importance to know to what relative extent different classes of society, possessing different assortments and grades of characteristics, reproduce themselves. If physical and mental traits are inherited, it is of prime importance for the welfare of state or nation that those stocks which are on the whole endowed with the best traits should contribute more, many more, individuals to the next generation than should those stocks whose characteristics are on the whole bad. And to say this need raise no quibble over what is "good" or "bad" in human stocks.

All right-minded people will agree that physical vigor and robust health are better in a racial or social group than impotence and liability to disease; or that keen intellects are better for the community than a general average stupidity. It is certainly desirable that the "good" thus broadly qualified should dominate in the nation and race. But, in order to dominate, "good" stocks must be highly fertile. The standpoint of eugenics in this matter was well expressed by Mr. Galton in his first paper on the subject: "The aim of eugenics is to bring as many influences as can be reasonably employed to cause the useful classes in the community to contribute more than their proportion to the next generation."

Now what are the existing conditions relative to the fertility of desirable as compared with undesirable classes? Unfortunately (from the American standpoint) nearly all the data which have so far been critically discussed have come from European peoples. The results of these studies may be condensed from the table on the following page, given by Professor Pearson in a recent lecture before Oxford University.

The conclusion to be drawn from this table is obvious. The average fertility of the pathological stocks is certainly as great as — in fact, somewhat greater than — that of

the normal stocks. The "bad" reproduces itself more liberally than does the "good." Further, there is strong reason to believe that, the majority of the "normal" stocks enumerated in the table are really exceptionally fertile.

FERTILITY IN PATHOLOGICAL STOCKS

CLASS	NATURE OF MARRIAGE (probably completed)	NO. OF CHILDREN
Deaf-mutes, England	"	6.2
Deaf-mutes, America	"	6.1
Tuberculous stock	"	5.7
Albinatic stock	"	5.9
Insane stock	"	6.0
Edinburgh degenerates	(incomplete)	6.1
London mentally defective	"	7.0
Manchester mentally defective	"	6.3
Criminals	(completed)	6.6

FERTILITY IN NORMAL STOCKS

CLASS	NATURE OF MARRIAGE	NO. OF CHILDREN
English middle class	(15 years, at least)	6.4
English family records	(completed)	5.3
English intellectual class	"	4.7
Working class, New South Wales	"	5.3
Danish professional class	(15 years at least)	5.2
Danish working class	(25 years at least)	5.3
Edinburgh normal artisan	(incomplete)	5.9
London normal artisan	"	5.1
Harvard graduates	"	5.0
English intellectuals	"	1.5

(Authority for last item, Mr. S. Webb)

Certainly their fertility markedly exceeds that of American college graduates, which has been so much discussed of late, or that of native New England stocks.

THE SURVIVAL OF THE UNFIT

Some may be inclined to say that, granting a greater fertility to pathological or degenerate stocks, the fact means very little, because of the much greater infant mortality among such stocks. According to such a view, it does not specially matter to the nation or race how many degenerates are born, provided the great majority of them die before reaching the age when they can themselves reproduce, or become a menace to society in criminal ways. In other words, this standpoint maintains that while the gross fertility of degenerate stocks may be greater than that of normal stocks, the net fertility is probably less.

But does the great infant mortality in the degenerate classes of society balance or compensate for the great fertility of these classes? It does not. The point has been particularly studied by Mr. David Heron, the present holder of the Francis Galton Fellowship in eugenics, for the population of London. What he found was this: Taking the different registration divisions of the city in order, those districts which have rates of infant mortality above the average also have more than the average number (per hundred wives) of children two to four years of age, children from five to fourteen years of age, and of

children aged thirteen to fifteen. In other words, there is a positive correlation or association in the city of London between the infant mortality on the one hand and the number of children who have passed beyond the period of infancy on the other hand. This means that in the districts where the population may be classed as degenerate or approaching that condition, the fertility is great enough not only to furnish material for the tremendous infant mortality but also to have remaining a surplus of children more than two years old, which surplus stands above the average for the number of such children in the different districts.

That the classes of society less worthy from the standpoint of national efficiency contribute an undue share to succeeding generations, has been shown in another way by Mr. Heron in the memoirs alluded to. For the population of London he studied the correlation or association between the birth-rate on the one hand and a series of relations indicative of social status. The general result was to show that in districts where the social status of the population is relatively high, the birth-rate is relatively low, and *vice versa*.

HOW EUGENICS WOULD IMPROVE THE RACE

What has been said will serve in some measure to indicate the sort of work which is being done in the new science of eugenics on the purely research side. It cannot but be evident to anyone who will take the trouble to study carefully the original memoirs which have appeared that at last a solid foundation is being laid for a truly scientific solution of the problem of national and social welfare. The standpoint of eugenics regarding the practical consequences of its scientific deductions cannot be better indicated than through the following paragraph taken from a recent paper by Professor Pearson:

"To-day we feed our criminals up, and we feed up the insane; we let both out of the prison or asylum 'reformed' or 'cured,' as the case may be, only after a few months to return to State supervision, leaving behind them the germs of a new generation of deteriorants. The average number of crimes due to the convicts in His Majesty's prisons to day is ten apiece. We cannot reform the criminal nor cure the insane from the standpoint of heredity; the taint varies not with their moral or mental conduct. These are products of somatic cells; the disease lies deeper in their germinal constitution. Education for the criminal;

fresh air for the tuberculous, rest and food for the neurotic—these are excellent; they may bring control, sound lungs, and sanity to the individual, but they will not save the offspring from the need of like treatment, nor from the danger of collapse when the time of strain comes. They cannot make a nation sound in mind and body; they merely screen a degeneracy behind a throng of arrested degenerates. Our highly developed human sympathy will no longer allow us to watch the State purify itself by aid of crude natural selection. We see pain and suffering only to relieve it, without inquiry as to the moral character of the sufferer or as to his national or racial value. And this is right. No man is responsible for his own being; nature and nurture, over which he had no control, have made him the being he is, good or evil. But here science steps in, crying: 'Let the reprieve be accepted, but next remind the social conscience of its duty to the race. No nation can preserve its efficiency unless dominant fertility be associated with the mentally and physically fitter stocks. The reprieve is granted, but let there be no heritage if you would build up and preserve a virile and efficient people.'"

How can eugenic ideals be made practically effective? Obviously not by any system of compulsion — at least, not for a long time to come. Rather must the process be one of gradual education. As Mr. Galton has pointed out, there are three stages which must be gone through in this process:

First, eugenics must be "made familiar as an academic question"; and, by sheer force of careful, thorough research on its fundamental problems, its importance must be made to be generally understood and accepted.

In the second place, the need for its practical development must be recognized.

Finally, its ideals "must be introduced into the national conscience like a new religion."

While at first thought this may seem to be a formidable programme, it really represents nothing revolutionary, but simply a development along lines already an ingrained part of the public sentiment in every civilized nation. It is no new thing for society to control in some degree the reproduction of its individual members. "Forbidden degrees" of marriage are an example of such control. When men shall come to have as great repugnance to the multiplication of physically or mentally defective individuals as they now have toward incest, one great end of eugenics will have been gained.

As has been indicated, the work in eugenics has thus far largely been done in England.

Certain of its problems have reached so acute a stage in that country as to attract the attention of statesmen. "National deterioration" was recently a much discussed topic. A Royal Commission sat with all due circumstance and, it must be confessed, not much to show in the way of results. But it must not for a moment be thought that England has a monopoly on pressing eugenic problems. In this country we have our full measure of such. The physically and mentally defective are with us; one high in authority has told us that the better native stocks in this country are not contributing their proper quota to future generations; and in our immigration problem and race question, for example, we have demands for eugenic research and practice whose urgency needs no emphasis. These last two problems are peculiarly our own, and on that account some discussion of them from the standpoint of eugenics is needed.

The most fundamental problem connected with the enormous influx of foreigners into this country is as to whether they can be "assimilated" into our national life. The discussions of this problem have, for the most part, failed to touch upon the really underlying questions involved. These underlying questions are biological. The immigrant comes into a new physical and biological environment when he comes to this country. How does he react to the environmental change? Is his net fertility increased or diminished? Is his mortality rate, both in general and in respect to particular diseases, increased or diminished? Are his children changed in physical type toward a new "American" type? If so, how many generations are involved in the change? To what extent does he mate within his own stock in successive generations on American soil? What is the relative fertility of matings between foreign and native stocks? These and similar matters seem to be the really fundamental problems of immigration, and they are obviously problems in the field of this new science. The necessity for their answer becomes daily more urgent. At present we have practically no data on them. Yet the collection of extensive and definite statistical data from which these questions could be answered would be a relatively easy matter for a properly organized Government bureau. If anyone is inclined to doubt this, let him look at what the Argentine Republic, whose immigration problem is in

many ways closely similar to ours, has done in this direction.

Again, the race question, while not wholly coming within the field of eugenics, has certain fundamental biological aspects which urgently need investigation from the viewpoint of the new science. Perhaps the most important of these biological problems is in regard to the death-rate of Negroes, both of pure and of mixed blood, in the "black belt" of the South and in the more northern parts of the country. The contention has been frequently made that the crossing of the Negro and the Caucasian races results in progeny physically inferior to the average of either race when pure, the inferiority being manifested chiefly in a lowered capacity to resist disease. It has further been maintained that, if this be a fact, the process of natural selection must in time practically free the country of Negro blood; or, as in the case of the American Indians, cause a great modification of the survivors. Whether there be any foundation for such belief can only be determined by a thorough statistical investigation of the matter, carried

out from the eugenic standpoint. Such an investigation should include a study of the fertility of various Negro stocks.

The pressing question is, how the work shall be organized and under what auspices it shall be carried out. It is my belief that the time will come when not only will eugenics form an integral part of the teaching and research work of the great universities, but also will come to be regarded as a legitimate field for the Federal Government. We have now Government bureaus for the study and development of plant and animal breeding; why not one for the study of the problems which have to do with the improvement of human breeds? The establishment of such a bureau only awaits the time when it shall come to be generally recognized that the welfare of the nation demands that attention be paid not alone to improving the external conditions of existence, but equally to maintaining a high standard of inborn quality in the people themselves, and, by so much as may be possible, continually raising this standard.

SOME BOOKS OF REAL VALUE

MR. ANDREW LANG, in his introduction to "Dumas' Memoirs" has expressed with his usual felicity the charm of these records. He says:

"They possess this advantage over most of the books, that the most crabbed critic cannot say that Dumas did not write them himself.

They are all his own, and the essential point of note is that they display all the humor, the goodness of heart, the overflowing joy of life, which make the charm of the novels. Here un-mixed, unadulterated, we have that essence of Dumas with which he transfigured the tame 'copy' drawn up by Maquet and others under his direction."

Two volumes out of the six are now ready, nominally covering the period from Alexandre's birth (1802) to 1825, when the young man plunged into the full life of Paris, which was as the breath of his nostrils. There are many dull chapters in Volume I. — historical summaries and documents — though delightful stories of his childhood and adolescence more than make up for these few lets and hindrances. It has all the fascination of movement, full

vitality, and gay irresponsibility which one associates with the creator of the immortal Three. (Macmillan, \$1.75 per volume.)

"The Indian's Book," by Miss Natalie Curtis, is the direct utterance of the Indians themselves. They dictated and she recorded. Songs, stories, and drawings — all have been purposely contributed by the Indians. They sang the songs directly to the recording pencil, and they are written exactly as they were rendered. Explanations and tales connected therewith are set down as they were told and all the drawings, including the cover design and the title-pages, were made by the Indians themselves; some are in color and some in black and white. Most interesting of all is the arrangement of their songs to music, and a corresponding translation of their musical phrases placed one beneath another like lines of verse. President Roosevelt says in an introductory note: "These songs cast a wholly new light on the depth and dignity of Indian thought, the simple beauty and strange charm — the charm of a vanished elder world — of Indian poetry." Many of the songs are traditional and of lost

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