The eugenic predicament / by S.J. Holmes.

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BY S. J. HOLMES

Professor of Zoology in the University of California

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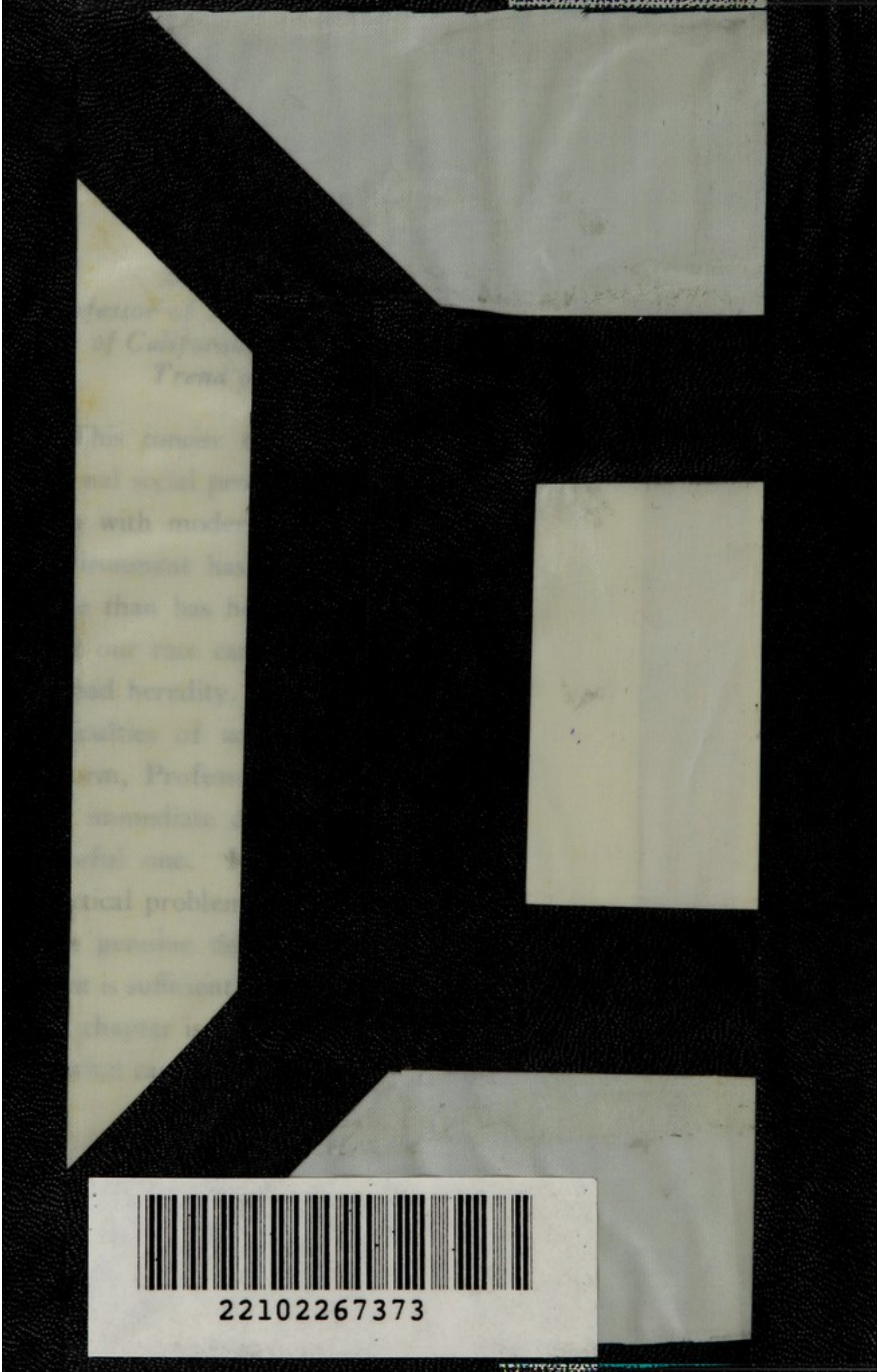


To be given to
the Eugenics Society
London

The Eugenic Predicament

February 1925.

BY THE SAME AUTHOR

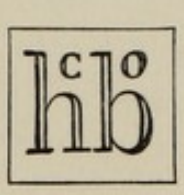
The Trend of the Race

THE EUGENIC PREDICAMENT

BY

S. J. HOLMES

Professor of Zoölogy, University of California



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Preface

DURING recent years knowledge bearing upon problems of eugenics has accumulated with extraordinary rapidity. Noteworthy progress has been made in ascertaining the mode of inheritance of various traits which are of especial importance from the eugenic standpoint. The recent systematic study of heredity in identical and fraternal twins has thrown much light on several hitherto obscure problems of human genetics, especially in regard to the transmission of mental defects and diseases. A large amount of evidence has accumulated in relation to the much discussed problem of the relative rôles of nature and nurture in the development of intelligence. As a result of numerous investigations in educational psychology, it is coming to be pretty clearly established that environment has its very distinct limitations as a means of developing intellectual power. Or, in other words, if brains are not inherited there is small chance of acquiring them.

Hereditarians and environmentalists have long wrangled over the question whether this, that, or the other peculiarity is to be attributed mainly to the environ-

ment or to some modification of the germ plasm. In the case of several human traits this question has been pretty well settled as a result of recent studies. There remain many knotty cases, but in regard to several of these the study of twins has proved very illuminating and promises to throw further light. Other methods of attack upon the heredity-environment problem are coming to be employed by an increasing number of trained investigators who are keenly alive to the import of the problem and eager to contribute to its solution whenever opportunity is afforded. There are hopeful signs, therefore, that we shall not have to wrangle indefinitely over this problem, but that it will gradually come to be settled, although it will doubtless be settled in different ways for various human traits and peculiarities.

Unless I have been misled in my efforts to form a just appraisal of the evidence, the progress of knowledge in this field has materially strengthened the position of the eugenist. But eugenics, like politics and philosophy, is a subject upon which we find a great diversity of opinions. Human beings generally disagree wherever there is the least opportunity for so doing. We take it for granted that experts in political science will draw very different conclusions from the same objective facts, and professors of philosophy of course cannot be expected to agree upon anything. In the natural sciences disagreements are commonly brought to a close with the advancement of knowledge. Competent

bacteriologists no longer differ over the germ theory of disease, and geneticists are now practically unanimous in accepting the chromosome theory of heredity and the wide applicability of Mendel's law. We cannot attribute differences over eugenics to ignorance of the subject, at least in all cases. Among prominent geneticists who have occupied themselves more or less with eugenics, we find some who are ardent supporters, some who adopt an attitude of limited and condescending approval, and others who are skeptical concerning some of the widely accepted doctrines of the eugenists' creed; but, so far as I am aware, no geneticist goes so far as to oppose eugenics *in toto*. Among students of the social sciences attitudes are even more varied. There are a few uncompromising opponents who are unwilling to concede that eugenics has any merits whatsoever.

When we disregard the prejudices and complexes which are so influential in shaping opinions on all matters touching human relationships, and consider the logical justifications for the opposition to eugenics, we find that these hinge upon disagreements over a relatively few crucial questions. People differ over eugenics because they differ over such subjects as the validity of mental tests, the degree to which environment is responsible for the development of this or that character, the extent to which children tend to be like their parents in mental traits, and the question how far social and economic status is correlated with levels of intelligence. In this volume especial attention has been de-

voted to certain key positions about which the battle between eugenists and their opponents has been concentrated. The smoke of battle is beginning to clear over some parts of the field and it is becoming apparent that the hereditarians have made some substantial gains. Some positions are defended only by a few stragglers who have a very imperfect vision of what is going on. At the same time the fundamental positions of the eugenists are, I believe, much more strongly supported than they were a generation ago. There remain, however, a number of controverted points about which the issue is more doubtful.

But whatever may be the verdict on matters about which there is still room for difference of opinion, it cannot be denied that people differ greatly in their hereditary endowments. To be well-born is to possess the greatest of all gifts. To the ill-born there is nothing which this world can afford that will be an adequate compensation for the lack of a good heredity. In common with other eugenists I am convinced that the physical and mental endowments of human beings can be improved or deteriorated, depending upon the quality of the people who provide the greatest number of children who reach the reproductive period of life. In common with most eugenists I am also inclined to think that in our present social and economic régime there has developed an anomalous correlation between success and sterility which tends insidiously to deteriorate the hereditary qualities of the race. The reasons for this

unwelcome conclusion are set forth in the following pages and supported with what I hope is an adequate amount of statistical evidence, a part of which, in order to save the reader from annoying interruptions, I have relegated to the Appendix.

Whether I am right or wrong about the present development of the race—and I hope that I may be wrong—eugenics is still of the greatest importance for human welfare. Our race carries a heavy burden of bad heredity which it would be very advantageous to eliminate. It also contains much good heredity which it would be very advantageous to increase. We are therefore faced with the important practical problem of devising feasible ways by which human heredity can be improved, a topic which has been briefly treated in the last chapter. If a democratically governed people is ever persuaded to take kindly to any means for promoting race betterment, it is essential that knowledge of heredity and eugenics be widely disseminated. Whether much or little can be done to improve this race of ours, enlightenment must come first. For this reason I have ventured to produce the present volume.

The Eugenic Predicament

CHAPTER I

Some Biological Preliminaries

THE subject matter of eugenics is the biological evolution of the human species. All organisms, human beings among the rest, are bound to undergo changes with the lapse of time, but the rate at which evolution proceeds varies enormously in different species and at different periods of their history. Some forms may stagnate almost indefinitely, like the lamp shell Lingula, which has persisted with little change from the Cambrian era to the present. After witnessing the evolution of the higher plants and the insects, the rise and extinction of the dinosaurs, in fact the whole evolution of vertebrate life, Lingula may be still on the scene after the human race has disappeared or become so profoundly changed as no longer to be recognizable as human.

But man, who is a recent upstart in the world of living beings, is in a very different biological situation. Unlike Lingula, he lives in an environment that is subject to rapid change. To an extent that is unparalleled in any other species, man creates his own environment, and hence becomes subjected to varied influences exerted by other human beings and the accumulated

products of their labors. All of the factors which effect evolutionary changes among more primitive forms of life are operative also in the human species, but, in addition to these, the biological evolution of man is profoundly influenced by social forces whose effects vary from place to place and from time to time.

The student of human evolution must distinguish as sharply as he can the changes resulting from the development of culture from those which occur in the hereditary endowments of the race. Theoretically this is simple enough, although perplexing difficulties sometimes present themselves. There is not the least doubt that most of the developments which form so striking a feature of the recent history of mankind have to do with the culture and institutions of man instead of his inherited qualities. There is not much reason to believe that the biological qualities of the race have materially improved for several thousands of years, although several thousand years are as nothing in the sight of the evolutionist. For all that we know, the tall Cro-Magnon men may have been as superior intellectually to modern man as they exceeded him in physical stature. Advance in civilization by no means implies biological advancement, and it is quite consistent with a certain degree of biological decadence. Not improbably peoples have become decadent several times in the course of human history. Nature does not care a fig whether her children advance or slump backwards. All that she is interested in is that they get on somehow

and transmit their precious germ plasm. She is concerned with the perpetuation of life rather than the kind of life that gets perpetuated, and if she can achieve biological success by converting her offspring into miserable degraded parasites, as she has so frequently done, it apparently suits her quite as well as if they became the ideal inhabitants of the best of all possible worlds.

We should cherish no illusions about old Mother Nature. Many people are prone to believe that evolution will inevitably lead onward and upward toward greater and greater perfection. This may be a comforting thought, and it is often believed simply for this reason, but as a biologist I cannot see the least foundation for such optimism. Evolution may proceed upward, downward, or merely sidewise so as to lead to divergence on about the same level of organization. Most of the developmental changes occurring in the human species have apparently been of the latter type. During the course of its evolution mankind has become split up into innumerable subdivisions. Peoples have become isolated in different geographical areas, and thus, since they are kept from fusing with other racial stocks, their variations gradually accumulate and lead to wider and wider divergence. The isolation need not be geographical; it may be due to traditional customs which lead the members of a group to breed with their own kind although they may be in close contact with other peoples. Even despite a certain amount of inter-

mingling, human races have diverged and rediverged as they have spread over and replenished the earth.

As species go, Homo sapiens—if we include all human beings under one species—exhibits a remarkable degree of plasticity. Even the Fundamentalist must concede that the human race has undergone a very considerable amount of change after its exit from the Ark. There can be no doubt, therefore, of man's capacity for extensive modification for better or for worse. This is evident not only because of the numerous modifications which human races have undergone in different parts of the globe, but on account of the great diversity of hereditary qualities manifested by the population of any area, and especially by the populations of the more highly civilized countries.

The improvements effected by the selective breeder depend upon the hereditary differences present in his material. Through intercrossing and selection breeders have produced a most remarkable number of diverse types. The numerous varieties of beautiful and finely flavored apples derived from a few strains of small, wild crab apples, the marvelous variety of forms which fanciers have developed from the original blue rock pigeon, the varied and often bizarre types of domestic fowl to be seen at a poultry show, or, still more, the great variety of size, form, color, and disposition found in the greyhound, the Saint Bernard, the bulldog, and the poodle, afford striking illustrations of the power of

selective breeding in the creation of diversity in almost all kinds of characteristics.

As a result of the progress of genetics we have much more accurate knowledge than formerly of the way in which such changes have been accomplished. Whether or not there is a limit to the changes that may be effected by selection has long been a disputed point. Believers in the fixity of species held that varieties can depart only to a limited extent from the parental stock owing to certain constitutional limitations imposed by the act of creation. Evolutionists, on the other hand, are convinced that there are no limits to the modifiability of species through variation and selection. The Darwinians argued that if artificial selection could produce striking transformations in a few generations, natural selection might, in the course of ages, give rise to almost any conceivable amount of change. Investigations of the way in which experimental breeding accomplishes its results have given us a conception of the workings of selection that is somewhat different from that of the older Darwinians. As a rule, improvement is accomplished at first quite rapidly, and then with greater and greater slowness until, in the course of a few generations, progress usually comes to a standstill. Stocks behave very differently as to the extent to which they can be thus modified. In some cases selection seems powerless to effect any change whatsoever. In Indian corn, on the other hand, selection has resulted in an increase of the oil and protein content through a con

siderable number of generations. The cause of these striking differences is now clear. If a species contains a great deal of hereditary diversity, or is, as the geneticists call it, heterozygous for many factors affecting the character in question, it may readily be changed by selection, and the limit of modification is not so quickly reached. What selection accomplishes is to combine in one strain the genetic factors that favor the development of the character which the breeder wishes to enhance. When all such factors have been brought together improvement comes to a close. This stage is arrived at in some species much sooner than in others because they contain less hereditary diversity. Where a species is of unmixed heredity, or entirely homozygous, it presents no hereditary variations upon which selection may act. Since Johannsen's classical experiments on selection in beans it has been recognized that, within pure lines, or in strains which are entirely homozygous, selection is quite ineffective, as one would expect according to what is now known of the principles of genetics.

Most of the varieties produced by selection in our domesticated species of plants and animals are the result of varied combinations of Mendelian factors. They are not new creations in quite the sense in which they were formerly regarded; they represent simply new groupings of factors already present in the stock. Numerous, therefore, as the kaleidoscopic combinations of old factors may be, they are, from the nature of the case, strictly limited, and selection must commonly

operate within bounds which cannot be transgressed. Further progress must wait upon the appearance of a new mutation, or a change in the hereditary factors, or genes. If we compare ordinary variations with the combinations of cards which may be obtained in dealing hands, the appearance of a new kind of gene may be said to add a new card to the pack. This is a relatively rare event, but thousands of such gene mutations have been known to arise, and several hundred of them have been observed in the fruit fly, Drosophila, during the few years in which this favorite object of the geneticist has been under observation. Changes in the genes afford the fundamental basis of evolution. And since these changes occur in many directions and affect all characteristics of the organism, it is possible for evolution to follow one or another of a great variety of paths.

On account of his diversified heredity, man is, as we have seen, a highly modifiable animal. Even if mutations did not arise in the hereditary factors in human germ plasm, the amount of change that could be produced through combining and segregating out the many different genes already in the stock would be enormous. The most diverse races of man are capable of interbreeding, and their progeny have never been proved to be lacking in fertility. Hence interracial crosses furnish almost limitless possibilities for the production of new varieties of human kind. Among these possibilities must be reckoned that of producing human breeds which are

superior to the highest, and others that are inferior to the lowest of existing races. Within the limits of the races now existing on the globe it would be easily possible, through the proper kind of selective breeding, to create a six-fingered strain, a split-handed strain, an albino strain, an almost bald and toothless strain, a deaf or a blind strain, a strain of achondroplastic dwarfs with their curiously big heads and deformed limbs, and strains of varying degrees of intelligence from imbeciles to persons of fine mental and physical endowments. All this and much more could be done simply by making use of the hereditary diversities already present in the human species.

The number of hereditary defects and anomalies borne by us lords of creation is legion. Whether these defects have been suffered to accumulate in human beings because we foster our unfortunates and permit them to transmit their peculiarities need not at present concern us. What I wish especially to emphasize here is that, whatever may have caused the present decrepitude of our race, the highly mixed and diversified nature of human germ plasm enables our hereditary endowments to become very much worse and also very much better than they actually are. Hence the possibility and the importance of eugenics.

CHAPTER II

The Legions of the Ill-Born

EUGENIC improvement has often been criticized as an impracticable dream because people can never agree upon just what kind of human beings we should strive to produce. Perhaps people do not need to agree, so long as it is recognized that there are many varieties of human excellence, and hence many lines along which the race could be made much better than it is. But whatever disagreements there may be on this score, there are many kinds of heredity which all sane persons would at once admit that we do not want.

In her distribution of hereditary gifts Mother Nature, for reasons best known to herself, has treated many of her children in a very shabby manner. The sins of the fathers that are visited upon the children are not nearly so important as numerous inherited afflictions which have no conceivable connection with parental misbehavior. As to the sins of the fathers we may confidently assert that the offspring escape scot-free from almost all of them.

The progress of genetics has shown that nearly all hereditary characteristics are transmitted in accordance with Mendel's law. The distribution of characters in

Mendelian heredity follows certain definite mathematical ratios which are an expression of the laws of probability. If I cross a red and a white four-o'clock, the second generation, if sufficiently numerous, will consist of one-fourth red, one-fourth white, and one-half pink four-o'clocks. The colors appear in this ratio for reasons quite analogous to those which determine the ratios of heads and tails in tossing pennies. If I toss up two pennies several hundred times they will both turn up heads in about one-fourth of the throws, both tails in about one-fourth of the throws, and a head and a tail in about one-half of the throws. We call these results an illustration of the laws of chance. Likewise the combinations of hereditary characters in a population are as much a matter of chance as the combinations one gets in tossing pennies or in dealing hands of cards. It is because hereditary traits are segregated in accordance with the laws of chance frequency distribution that the phenomena of heredity can be reduced to relatively simple mathematical laws. There is a great deal of misconception on the subject of chance. People associate it with chaos instead of law and order. It is precisely the demonstration that the phenomena of heredity follow Mendel's law, a law of chance, that has made genetics the one branch of biology that is qualified to rank as an exact science.

So far as we know, all human heredity is Mendelian. At least we do not know any case that is not. In those species whose genetics is best known, such as the fruit

fly and our domestic varieties of rats, mice, guinea pigs, and rabbits, inheritance, so far as it has been adequately worked out, follows Mendel's law. This law applies alike from the higher plants and animals down to, and perhaps including, some of the unicellular forms of life. It depends everywhere upon the same cellular mechanism and the same kind of chromosome behavior. The cellular phenomena which afford the basis for Mendelian heredity are in principle precisely the same in man as in other organisms, both plant and animal, and there is not the least reason for doubting that heredity in man follows the same laws as that of other species. The difficulties of studying human heredity and the impracticability of testing conclusions by experimental breeding make it impossible to demonstrate that a number of characteristics are transmitted in a Mendelian manner. Information has to be gained as opportunities for observation present themselves. Nevertheless there have accumulated a large number of pedigree studies which have yielded strong evidence of Mendelian heredity in the transmission of many traits.

Even a brief description of all the inherited defects of human beings which handicap individuals more or less seriously would fill a large volume. Among the hereditary defects of the eye, to take but a single organ, may be mentioned cataract, misplaced lens, absence of the iris, cleft iris, atrophy of the optic nerve, pigmentary retinitis, amaurosis, strabismus, glaucoma, nystagmus, color blindness, night blindness, and microphthalmia.

A few years ago an American ophthalmologist, Dr. Lucien Howe, compiled a bibliography of hereditary defects of the eye. It formed quite a large pamphlet and contained over eight hundred titles. Were it brought down to date the number of titles would probably be about doubled. Several of these defects caused blindness, either at birth or later in life, as is sometimes the case with cataract and hereditary atrophy of the optic nerve.

Hereditary defects of the organs of hearing are of many kinds also, but they are usually not recognized until they result in total or partial deafness. It has long been recognized that deafness may be hereditary. In his memoir *The Formation of a Deaf Variety of the Human Race*, Dr. A. G. Bell pointed out that the deaf tend to marry the deaf, and that deaf children frequently result from such unions. Not all deafness is hereditary. Loss of hearing may result from trauma, syphilis, meningitis, scarlet fever, measles, diphtheria, and tuberculosis. A child may even be born deaf without having inherited this defect. On the other hand, there is often an inherited tendency to become deaf after middle age. In several cases deafness appears to have been transmitted as a simple recessive trait, and in such instances one might expect that the marriage of two deaf mutes would result in nothing but deaf children. Several such unfortunate families are known. There are other cases in which two deaf mutes have produced offspring with unimpaired hearing. In one or

both parents in such a case, the deafness may not have been of the hereditary type. Or again, it may have been hereditary and dependent upon different recessive factors, so that when these are combined each is prevented from doing harm by its corresponding dominant factor. The hereditary forms of deafness may result from atrophy of the auditory nerve, impairment of the cochlea, defects of the small bones involved in the transmission of vibrations from the drum to the inner ear, and several other physical anomalies. Where the same kind of defect is present in both parents all of the offspring are apt to be affected in the same way. This is why deafness is more liable to appear in the offspring if the parents are related by blood. Both parents are then much more likely to have the same hereditary defect because both of them derived it from a common source. As a result of this fact a high percentage of deafness is sometimes found in inbred communities. On the island of Martha's Vineyard, for instance, it has been estimated that in 1880 one person out of every twenty-five was a deaf mute.

Another factor in the perpetuation of hereditary deafness is the segregation of large numbers of deaf mutes in institutions where marriages are often contracted as a result of the association. In no state are deaf mutes forbidden to marry, and a considerable proportion of them do marry. Deaf mutes contemplating marriage should clearly realize that if their deafness is of the hered-

itary type, there is grave danger that the affliction will descend upon their offspring.

INSANITY

Insanity, like deafness, may be either inherited or acquired. The extent to which it is dependent upon heredity is a matter upon which alienists have given us a most astonishing variety of estimates. One can find percentages varying all the way from 3 per cent to over 90 per cent. We can afford to pass over most of the older writings on the heredity of insanity, although they often contain many interesting and valuable bits of information which we can now interpret according to principles that were unknown to those who reported them. We are much better equipped than formerly for interpreting the pedigrees of insane stocks; nevertheless the subject presents many baffling problems for the student of human genetics. We must rid ourselves of the notion that insanity is a definite clinical entity like haemophilia or hereditary fragility of bones. It is a general blanket term to cover a great number of mental diseases which are almost as varied as the ills of the body. Perhaps, as some alienists have recommended, it is time that this rather absurd designation be discarded entirely. Naturally if there are various mental ailments included under the term insanity we should not expect all of them to be inherited (in so far as they are inherited at all) in just the same way.

Psychiatrists admit that the classification of the in-

sanities is in a most unsatisfactory state. They have more troubles with it than the botanists have in trying to group the species and varieties of the asters and the brambles. There are some commonly recognized types, such as manic-depressive insanity, dementia praecox, etc., but there are so many subvarieties and intermediate states of mental disease that any clear-cut grouping seems at present to be hopeless. Any hereditary factor that predisposes an individual to become insane is inevitably influenced in its expression by other hereditary factors with which it happens to be associated. Moreover, the particular ways in which symptoms manifest themselves also depend upon the health, habits, education, and acquired emotional attitudes of the affected person. With a variety of hereditary defects predisposing people to insanity, and with the multifarious environments and experiences to which people are exposed, it is not surprising that insanity should manifest itself in all kinds of ways and in all degrees of severity. The Quaker who remarked to his friend, "Everybody is a bit queer except thee and me and sometimes I have my doubts about thee," was not far from the truth. No one perhaps is altogether sane, at least at all times.

One of the most prevalent fallacies concerning insanity is that either it is hereditary or it is not. As a matter of fact it is usually both. In works on insanity it is not uncommon to find a certain percentage of cases gravely assigned to "heredity" as one cause along

with alcoholism, syphilis, worry, shock, and a number of others. One unfortunate implication of such a grouping is that if insanity is hereditary nothing can be done to cure it. In some cases nothing can be done. In many cases, however, what is inherited is an unstable nervous system predisposing an individual to insanity without inevitably producing this result if the environment is favorable to mental health. In other words, it is often possible to prevent a person from falling a victim to his defective heredity. People with an unstable hereditary constitution may need only an unfortunate experience or an unfavorable environment to bring out their latent predisposition. Other people stand up under the stress of all sorts of illness, shocks, and misfortune without exhibiting a trace of abnormal mentality. Apparently there are all degrees of readiness to topple over into the limbo of insanity under the influence of environmental impacts. Various so-called causes of insanity, such as alcohol, focal infections, and disappointment in love, one or all of which most people have experienced to a greater or less degree, produce their dire effects only upon those individuals whose heredity has poorly equipped them for a life in an insalubrious and inconsiderate world. The real extent to which insanity should be attributed to bad heredity is apt therefore to be underestimated.

The relative rôles of heredity and environment in causing insanity vary from person to person. We cannot say categorically that so many persons are insane be-

cause of "heredity," and so many others are insane because they took to drink, acquired syphilis, or worried over finances. The mental health of a person is a product of both heredity and environment, and in different individuals now the hereditary and now the environmental factors play the predominating rôle. In the malady known as Huntington's chorea we have a form of insanity which is strongly hereditary and is apparently transmitted as a simple, dominant Mendelian character. This disease usually comes on relatively late in life, frequently after its victim has married and produced children. It begins with irregular muscular movements and tremors, and soon involves unsteadiness of gait and difficulties of speech. As the symptoms increase in severity, the mental faculties deteriorate, the patient becomes quite helpless, and finally the disease leads to a fatal termination. If a person is unlucky enough to draw the fatal gene in the Mendelian lottery, nothing can be done to stay the inevitable course of this disease. Davenport and Muncie have succeeded in tracing nine hundred and sixty-two cases of this relatively rare disease back to six or seven ancestors, including three brothers who came to the United States in the seventeenth century. One would think that an affliction so terrible and at the same time so obviously hereditary would have died out as a result of its fatal character or because people liable to be affected would refrain from endangering their offspring, but evidently such a consideration has not

proved strong enough to curb the reproductive urge.

The precise way in which most other forms of insanity are transmitted is more obscure. Some kinds of hereditary insanity appear to be recessive or partly recessive traits, but whether they are due mainly to a single factor or to two or more factors is not definitely established. One of the most common types, manic-depressive insanity, is also one of the most frequently

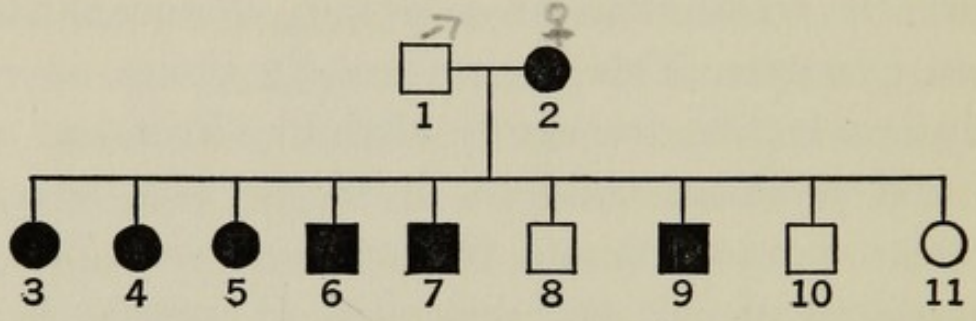

FIGURE 1. Inheritance of manic-depressive insanity. Affected individuals in black; squares represent males, circles, females. No. 11 died at three years of age. (Data from Guyer.)

inherited. A rather striking illustration of the transmission of this latter variety is reported by Guyer. The father of the family lived to be over eighty years of age and when interviewed was unable to talk coherently and had lost much of his memory, but this may have been due to senescence instead of organic mental disease. The mother had an attack of insanity as early as her ninth year, and two other attacks at the ages of twenty-nine and thirty-six. Later in life she became an inmate of the Mendota Hospital for the Insane on five separate occasions and was twice in the County Asylum.

Her first daughter was in the state asylum five times. Her second daughter was once committed to the same asylum. A third daughter also spent a short time in the same institution. There were two sons, each of whom was committed to an asylum on two occasions, and a third son who had one attack of insanity. There was one child who died in her third year and two adults who apparently were sane. All six of the insane children in this unfortunate family suffered from the same type of insanity as the mother.

Cases of this sort could be multiplied many times over. What is especially needed in this field is a large number of very thoroughly worked out family histories in which all the members are carefully studied and in which full records are kept of the character and course of the mental disease in each affected person. It is only in exceptional cases that such studies are possible. There have been many investigations of the percentage of cases in which insanity is found among the relatives of insane patients. The statistical investigations of Pearson, Schuster, and Heron have shown that insanity runs in families to about the same degree as stature, hair color, and a number of other physical traits. Pearson expresses the opinion that "if completed histories are taken 40 per cent of insane offspring of insane parents is not an overestimate." A good deal of the literature on this topic is almost amusing in the naïve way in which the statistical data are treated. We have statements made about the occurence of in-

sanity among relatives or among ancestors without specifying what ancestors or what relatives are included. Naturally the percentage of insanity found among "relatives" will vary according to whether we limit the inquiry to parents, grandparents, and siblings, or include also the uncles and the cousins and the aunts. Then there is much variation in the kinds of defects reported among the relatives as possibly indicating that the patient has been affected by some malign hereditary influence. A report on the extent of mental deficiency in Michigan in 1915 stated that out of 4,917 insane about 65.4 per cent "had among their ancestors or family such hereditary influence as insanity, apoplexy, or paralysis, psychopathic abnormalities or alcoholism." Passing over the fact that no statement is made as to who are included among the ancestors or members of the family, one is led to inquire how apoplexy and paralysis are supposed to function in the transmission of insanity, and why the worthy commissioners have seen fit to give alcoholism a position as a "hereditary influence." Some alcoholics are undoubtedly psychopathic, but that alcoholism in parents accounts for insanity in the offspring is surely a bit absurd. One might include the moderate drinkers and get the percentage of hereditary defect in the ancestry up to nearly 100 per cent.

This indefiniteness is by no means exceptional in the literature on insanity. In preparing a fairly extensive bibliography on eugenics I have collected over five

hundred contributions on the inheritance of insanity and have waded through many of them and skimmed many more. A very large proportion of the numerous contributions on this subject really do not advance our knowledge one iota. Nevertheless, despite the difficulties of the subject and its many pitfalls, substantial progress has been made, especially in recent years. It has been investigated by several workers who are equipped with a thorough knowledge of both mental disease and the principles of genetics. Abundant evidence has been adduced that insanity not only runs in families, but that, along with considerable variability in its manifestation, there is a pronounced tendency for the same types of insanity to recur in successive generations. Taking the cases in which one of the offspring has manic-depressive insanity and one parent is psychotic, Hoffmann finds that the type of the parent's insanity is manic-depressive also in 68.9 per cent of cases, dementia praecox in 3.6 per cent, and "organic psychoses" in 10.9 per cent of the cases. Rüdin finds that out of 566 siblings of patients with manic-depressive insanity 7.4 per cent had manic-depressive insanity also, and that when one parent and one offspring had manic-depressive insanity, 24.6 per cent of the siblings were affected by the same disease. Similar results have been reported by Hoffmann, who finds that in 150 children of dementia praecox parents 13 to 15, or 8.6 to 10 per cent, suffered from dementia praecox.

There are other types of insanity that appear to be

less evidently inherited, but even in those cases in which some environmental factor is considered to be primarily responsible the rôle of heredity is not to be neglected. General paresis is universally recognized as caused by syphilis, but only a small percentage of syphilitics fall victims to this affliction. Why does syphilis affect only certain individuals and not others in this particular way? In his investigations on general paresis Schroeder found that 54 per cent of the men and 78 per cent of the women were affected with a neuropathic heredity of one kind or another, so that it is not improbable that constitutional factors may play a deciding rôle even in this environmentally caused disease. When I innocently ask my medical colleagues concerning the possible rôle of heredity in general paresis I usually get the reply: "General paresis, you know, is caused by syphilis. Consequently heredity has nothing to do with it." This attitude toward heredity as a factor in human ills is very common, and is perhaps shared by the majority of the medical profession who have not made themselves masters of the general principles of modern genetics and especially of the factorial conception of heredity.

As to the rôle of heredity in nervous disorders occasioned by syphilis, an interesting case is furnished by two Negroes with locomotor ataxia. The two Negroes were identical twins and hence of the same heredity. Both contracted syphilis at about the same time. Both exhibited the same difficulties of speech, the same in-

sensitive areas, and the same peculiarities of gait. It is difficult to escape the conclusion that the course of the infection in this instance was strongly influenced by the inherited constitution.

Now that the subject of identical twins has been properly introduced, we may refer to some remarkable observations on insanity in twins of this class. Most of the observations on this subject have been made by the Germans, who have given us our best studies on the inheritance of insanity and allied nervous disorders. Data on identical twins are of very great value in enabling us to ascertain the extent to which a trait is determined by heredity, as well as in throwing light upon the mode of hereditary transmission. Where one member of a pair of identical twins becomes insane it is the rule that the other member becomes insane also. There is generally also much similarity in the time of onset and the course of development of the symptoms. In seventeen cases reported by Luxenburger in which one member of a pair of identical twins had dementia praecox, the other member clearly had the same disease in ten cases; in three other pairs both members were probably dementia praecox cases, and in only two pairs was one twin apparently unaffected. Lange has collected as many as fifty-six cases in which dementia praecox occurs among identical twins. Fifty-two of these show concordant or very similar symptoms of dementia praecox in both members. Among the four discordant pairs two were designated as "schizoid," or more or

less similar to dementia praecox; in a third case one member was "abnormal," while in a fourth dementia praecox was found in one twin who had sustained a severe injury to the skull. Contrasted with these Lange found a quite different situation among ordinary, or fraternal, twins. In twenty-five such pairs there were only five in which both twins were affected, which is not far from what one would expect among ordinary brothers and sisters.

According to Luxenburger's compilation of cases of manic-depressive insanity in twins up to 1930, both members of a pair were affected in twenty-four out of twenty-five pairs of twins diagnosed as identical, whereas in the great majority of cases in which this form of insanity occurred in ordinary fraternal twins it was limited to one member. When both twins are affected it sometimes happens that the manic type predominates in one member and the depressive type in another. Inasmuch as these phases frequently alternate in the same individual, it is not improbable that the same hereditary factor might manifest itself in these different forms as a result of the differences in the developmental histories of two persons of the same genetic constitution.

In this country the so-called twin method of studying the heredity of insanity is now being carried on by Dr. A. J. Rosanoff, who has recently published some of his preliminary results. In this study twelve cases of dementia praecox were found in identical twins, and

in ten of these the disorder occurred in both members of a pair, while in only two pairs one twin had dementia praecox while the other was normal. Among twins who were probably fraternal, both were affected in ten cases and only one affected in twenty-four. Among identical twins with manic-depressive insanity both were affected in all of the eight cases that were found. In the twins of the fraternal group there was only one case in which both members were insane and thirteen instances in which the disorder was confined to one member. Further evidence to the same purport has recently been reported from Holland by Legras. In all six of the pairs of identical twins showing dementia praecox both members had the same type of insanity, while in all of the nine fraternal twins in which dementia praecox occurred it appeared in only one person in each pair.

These are very impressive results. They make it quite clear that when two people have exactly the same hereditary factors the probabilities are that if one is afflicted by dementia praecox or manic-depressive insanity the other will also become insane and suffer from insanity of a similar type. As a result of such studies as those described it is now coming to be evident that, so far as some of the more prevalent forms of insanity are concerned, heredity is a factor of very great potency. Alienists have frequently been misled in this matter by the fact that insane people often come from normal ancestors and give rise in turn to normal children. In the light of Mendel's law of heredity such

facts should no longer be confusing. They can be paralleled by the reappearance of characteristics in other organisms whose mode of inheritance has been accurately determined. The inheritance of insanity is a subject about which we cannot afford to cherish any fond illusions. One's views upon it may influence choice in marriage, the management of insane dependents, and indirectly the policy of the state in regard to its insane population. The pronouncements of certain writers who state that there is no such thing as inherited insanity—for there are some who go even as far as this—are apt, if taken seriously, to do a lot of harm. Accordingly in the discussion of this topic I have endeavored to support my conclusions by adducing a number of solid facts. And I have taken pains to obtain these from writers who are recognized as competent specialists in their field. Unless I have been misled in my efforts to form the best judgment on this problem, the rôle of heredity in the causation of insanity is considerably greater than is commonly conceded.

THE EPILEPTICS

Most writers on epilepsy ascribe a considerable etiological importance to heredity. There is no gainsaying the fact, however, that numerous cases of epilepsy are due to injury and disease. The cerebral injuries inflicted during childbirth, especially when difficult labor leads to the employment of instruments, are responsible for the occurrence of many epileptic children.

Syphilis is also a factor of importance, as is indicated by the high percentage of epileptics that give positive reactions to tests for this disease. We may concede this much without attempting to decide which of the exceedingly discrepant findings on this subject is nearest the truth.

Even with the best of care the outcome of most cases of genuine epilepsy is unfavorable. It is true that a larger proportion are cured now than formerly, or at least they are so much improved that their seizures no longer occur. It is not improbable that when more insight is gained into the conditions which occasion the outbreak of the attacks much more can be done to prevent their occurrence. But even if epilepsy can be completely cured, this fact is not inconsistent with the conclusion that its primary cause is some defect in the germ plasm. A child may be cured of the effects of inherited deficiency of the thyroid by feeding it with thyroxin, but this proves nothing in regard to the primary cause of the defect.

In epilepsy, as in insanity, we have a large number of nervous disorders which have a certain similarity of manifestation despite their essential difference of origin. A recent writer has distinguished over a hundred varieties. One type, relatively rare in most countries, is myoclonus epilepsy, which has been studied by Lundborg in Sweden, where it occurred in certain isolated communities. Lundborg's classical investigation showed that myoclonus epilepsy behaves as if it were the result

of a single recessive gene. All of the seventeen known cases in Sweden were traced back to a single ancestor in the eighteenth century. Consanguineous marriages often brought the trait to light, as they have done in so many other characters due to recessive factors.

In other varieties of epilepsy the precise mode of transmission is less clear. Davenport and Weeks regard epilepsy as a Mendelian recessive character which sometimes reveals its partially suppressed condition, as migraine or some other nervous disorder, in heterozygous individuals, or carriers. Were this true, one would expect that when two parents suffer from hereditary epilepsy all of the children would be epileptic also. There are a few cases in which this expectation is realized, but it is not a general rule. Brain has described a family in which the two parents were epileptic and the four children were all normal. One of the parents had an epileptic maternal grandfather and uncle, but the epilepsy of the other parent may have been caused by some environmental agency; or again the epilepsy may have been inherited in both parents, but caused by quite different genes.

Although some doubt attaches to the precise way in which epilepsy is ordinarily transmitted, the evidence that it characterizes certain hereditary stocks much more than others is overwhelming. Echeverria found that among 531 children of epileptics, 105 were normal, 78 epileptic, 11 insane, 18 feeble-minded, and 222 died young. Thom reports that among 431 children of

epileptics 14 were also epileptic, 2 insane, 14 feeble-minded, and 151 died early in life. Epilepsy, he thinks, is not always transmitted as such. What is inherited is rather an unstable nervous organization which may appear as epilepsy or as some other nervous malady. But however variable may be the manifestations of inherited epilepsy, we undoubtedly find that, as in the transmission of various forms of insanity, there is a pronounced tendency for like to produce like. The epileptic diathesis certainly does not produce epilepsy, insanity, and feeble-mindedness with equal frequency.

In epilepsy, as in insanity, the afflicted individual usually comes from parents who are apparently normal. Hence the conclusion is apt to be drawn that in most cases heredity has nothing to do in causing the disorder. Where a trait is recessive one would expect to find many cases in which it is not only absent in the parents, but no traces of it can be found in the more remote ancestry or collateral relatives. Even now such facts are often taken to indicate the absence of hereditary influence. In a recent number of the *British Medical Journal* Dr. S. A. K. Wilson tells us that his experience has convinced him that the hereditary factor is persistently overrated and "that it is high time protest should be unitedly voiced by neurologists against the portentous assumption of a sinister prognosis to every case of epilepsy because of a supposed inheritance and consequent incurability. . . . Even if we assume heredity for say 20 per cent, this means that in no less than

80 per cent that factor is altogether wanting." And as a further indication of the impotency of the hereditary factor, he cites a case of two epileptic sisters who were identical twins in whose ancestry no trace of epilepsy could be found! I do not know to what extent Dr. Wilson has endeavored to make himself familiar with the principles of Mendelian heredity, but it is certainly curious to find a fact pointing almost unmistakably to the genetic origin of epilepsy brought forward to disprove it. An equally groundless conclusion, as we have pointed out before, is that because a malady is caused by heredity its prognosis is therefore sinister. But passing by these misconceptions and coming to Dr. Wilson's main contention against the hereditarians, does it follow that if epilepsy is not found in 80 per cent of the ancestry it is therefore caused in these instances by something besides heredity? By parity of reasoning it might be proved that heredity has nothing to do with the origin of black sheep because, as is well known, black sheep are usually produced by white sheep. It has been shown that blackness in sheep is a Mendelian recessive character which is widely scattered through white flocks. When a mating occurs between two white sheep both of which carry the recessive gene for blackness, one-fourth of their offspring would be expected to be black. Hence the mysterious appearance of black sheep in flocks which may have produced nothing but white sheep for a long time.

If a recessive character is rare one would expect that

it would usually appear in families in which no trace of it was previously known. There are several recessive characters that uniformly prove fatal at an early period of life and which have been traced to a single ancestor. Being lethal in their effect, they are obviously not met with among the parents of the affected offspring.

Epilepsy is commonly estimated to occur, on the average, in considerably less than 1 per cent of the population. Granting that it occurs in one out of four hundred cases, the heterozygotes, or carriers, would constitute about 9.5 per cent of the population, on the assumption that it is due to a single recessive gene. However, epilepsy probably occurs in less than the expected percentage of the parents of epileptics, because, while not lethal, it is partly lethal. Many epileptics die young, and many others on account of their affliction do not marry. Not improbably the percentage of epileptics among the children of epileptics is reduced because many affected children die before the onset of the malady. The degree to which a trait is found in both parents and offspring is by no means an adequate measure of the extent to which it is due to heredity. A trait may owe its origin exclusively to heredity and yet appear but rarely, and if lethal never, in both parent and progeny.

While certain kinds of epilepsy are doubtless recessive, there are other forms that are incompletely recessive, or partly dominant, which means the same

thing. Some very interesting pedigrees have recently been published by Gordon. One of these is based on the descendants of a man who had convulsive seizures beginning in his tenth year and continuing, with intervals of comparative freedom from attacks, until old age. His two sons were both epileptics. One of them refused to marry because he feared that he might transmit epilepsy to his children. The other son, who did not believe that epilepsy could be transmitted, married and produced four offspring. Two of these, a son and a daughter, were epileptic. The epileptic daughter married and two of her six children were epileptic also. One of the normal sons married and produced two epileptic daughters.

In another family both of the parents were epileptic, but one of the two daughters was epileptic and the other normal. The epileptic daughter married and had four children, two normal and two epileptic. One of the latter produced two epileptic sons, and the other an epileptic daughter. One of the normal daughters married and had three daughters, all of whom developed epilepsy. The normal daughter of the original pair married and produced one normal and one epileptic child. The latter married and of the four children born two were epileptics.

To be sure, these are selected cases, and it is sometimes possible to find several instances of a trait occurring in one family purely as a result of chance, but the probability of such an association is greatly reduced if

the trait is relatively rare. Since epilepsy is found in less than 1 per cent of the population, the chance that it would occur in any family as frequently as is shown in the second pedigree we have cited is less than one in many million times the entire population of the globe. Clearly chance alone cannot account for such a clustering of epileptics in family groups.

The recorded instances of epilepsy in twins have not been numerous. Among the monozygotic, or identical, twins thus far reported, when one member has epilepsy the other has epilepsy also in rather more than the majority of cases. On the other hand, the occurrence of epilepsy in both members of a pair definitely diagnosed as dizygotic, or fraternal, is practically unknown. In his recent study of mental disorders in twins Dr. Rosanoff remarks: "In our six cases of epilepsy both are affected in the one pair of monozygotic twins, and only one is affected in each pair of dizygotic twins (same and opposite sexes)." On account of its relative rarity the occurrence of epilepsy in both members of several pairs of identical twins is a very significant fact.

THE FEEBLE-MINDED

The feeble-minded are coming to be much more in the public eye than they were a generation or two ago. Whether or not there are more of them now than formerly, they at least attract more attention. Ordinarily people did not concern themselves much with any but the extreme types, such as the village idiot, but with

the advent of mental tests many individuals who previously passed muster as normal are now put into the class that we politely designate as morons. And the morons, we are coming to find out, are a source of many troubles.

Mental defect exists in all grades. As commonly defined, an idiot is a person whose mental development is so low that he can be taught to perform only the very simplest tasks. His intelligence does not develop beyond that of an average child of three or four years of age. Imbeciles are able to take care of themselves, but are unable to earn a living because of their mental incapacity. Their intelligence corresponds to that of a child of three to seven years. The morons have a mental age of seven to twelve years. They can, under supervision, be more or less self-supporting. Hence those of them who are industrious and well behaved may perform a useful, though humble, rôle in our industrial life. In terms of intelligence quotients idiots range up to 25, imbeciles from 25 to 50, and morons from 50 to 70, or, as defined by the American Association for the Study of Feeble-Mindedness, from 50 to 74. Then come the border-line and dull normal cases that grade up to the large group with medium intelligence to which most of us belong.

Numerically the idiots represent but a very small class, and as they are usually kept under supervision either in homes or in institutions they do not constitute a serious menace from the standpoint of eugenics. The

imbeciles are more numerous, and the morons more plentiful still. According to the report of the school medical officer the percentages of mental defectives in London (1914-1930) were: idiots, 1.17 per cent; imbeciles, 13.78 per cent; and mentally deficient or feeble-minded, 85.05 per cent. These proportions are fairly close to those found by the Mental Deficiency Committee in its extensive survey of urban areas in Great Britain, namely: idiots, 3.6 per cent; imbeciles, 16.6 per cent; and feeble-minded, 80.3 per cent. If we should enumerate the border-line and dull normal people we should find them constituting a still more numerous class. The largest group of all is constituted by the individuals who cluster around mediocrity.

Mental defect, as Pearson has pointed out, appears to vary in a continuous manner, as does mental ability of all kinds. No sharp line of cleavage can be drawn between the several classes. What constitutes a mental defective, therefore, is a matter of purely arbitrary classification, and since standards of classification vary in different countries, and not infrequently among different investigators in the same country, there is inevitably a good deal of difference in the estimated proportions of defectives in the general population. This same circumstance is, I believe, responsible for much of the difference of opinion as to the extent to which feeble-mindedness is a transmissible trait.

All competent students of the subject agree that mental defect may be caused by both hereditary and en-

vironmental factors, however much they may wrangle over which of these factors is the more potent. By the proper treatment a child with the best possible heredity may be converted into a driveling idiot. Too many children have been made feeble-minded by injuries to the brain at the time of their birth. Endocrine disturbances in the mother, toxic influences during pregnancy, maternal alcoholism, meningitis, encephalitis, and other unfavorable influences, either before or after birth, are held to be responsible for many cases of arrested mental development. Some feeble-mindedness is doubtless to be attributed to syphilis. The unfortunate children whom, for some inscrutable reason, Providence has seen fit to inflict with this miserable disease, exhibit a great variety of symptoms. They may suffer from many nervous disorders; they may become epileptic; or later in life they may develop insanity. After numerous investigations of the prevalence of syphilis among the feeble-minded we are still uncertain as to the rôle which this disease plays in the causation of mental defect. The findings reported from applying Wassermann and other tests to groups of mental defectives show a remarkable amount of disagreement. This is proved by the following percentages of positive reactions found by different investigators: Thomson, 1.5; Dayton, 3.4; Kellner, 3.7; Attwood, 15; Gordon, 15.5; Kröber, 21; Raviart, 30; Higgins, 42; and Frazer, 44. Kaplan (*Serology of Nervous Diseases*) is inclined to be skeptical in regard to the high percentages

of positive reactions sometimes reported. Not being a specialist in this field, I express no opinion where the doctors so obviously disagree. The prevalence of syphilis doubtless varies considerably in different communities, but whether to the extent indicated by the figures just quoted seems very doubtful.

Most students of feeble-mindedness believe that the percentage of cases caused by syphilis is not high. Tredgold, in his volume on *Mental Deficiency*, states that "on the whole, I doubt, whether syphilitic aments constitute more than 2 to 3 per cent at the most of mental defectives of all ages." He also states that "it is quite clear that many infected children grow up without showing any signs of mental impairment," so that if a feeble-minded child is syphilitic it by no means follows that the disease is a cause of his low mental development. In the opinion of Kraepelin, Tredgold, and others, syphilis is more commonly found in the lowest orders of defectives than among the more normal morons. It has been suggested that syphilis is more apt to impair the nervous system in offspring of neuropathic stock, as we have seen that general paresis is more apt to do later in life.

Passing to the forms of feeble-mindedness due to heredity, we find more or less divergence of opinion as to its mode of transmission. Davenport, Goddard, and many others have concluded that feeble-mindedness is a Mendelian recessive trait. According to this view one can understand why feeble-minded children are

sometimes born to intelligent parents. Both parents in this case are regarded as heterozygous for the factor or factors upon which feeble-mindedness depends. Frequently feeble-minded children result from matings

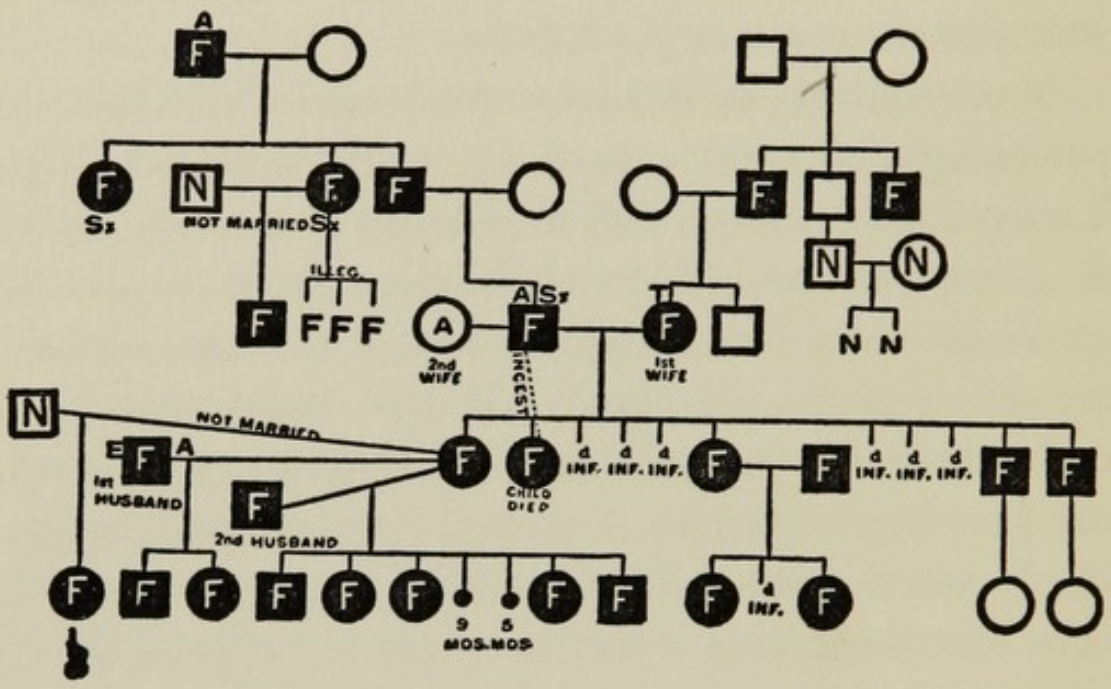

FIGURE 2. Heredity of feeble-mindedness. The squares represent males, the circles females. The dark squares and circles indicate feeble-mindedness. *A*, alcoholic; *E*, epileptic; *N*, normal; *d. inf.*, died in infancy. Note that when both parents are feeble-minded all the children who grow up are feeble-minded also. (After Goddard.)

between a normal and a feeble-minded individual, the normal person being regarded as a carrier for the defect. When two feeble-minded persons mate, then, if both owe their defect to the same hereditary factor, one would expect that all of the children would also be feeble-minded. In fact the proportion of feeble-minded offspring from such matings comes very close to the

expected results. Goddard has collected 482 cases of children born to parents both of whom were feeble-minded and all but 6 of these children were feeble-minded also. Out of 222 children of 41 feeble-minded parents in the Kallikak family only 2 were considered normal.

These few exceptions to the general rule may be plausibly explained in more than one way. One of the parents, for instance, may have owed his or her defect to some cause other than heredity. Or the supposed father of these children may not have been their true parent, a supposition which is not improbable on account of the high percentage of illegitimacy that prevails in mentally defective stocks. Or again, if we regard mental defectiveness as due to a number of hereditary factors, a child of two feeble-minded parents may draw a better combination of factors out of the Mendelian lottery than that possessed by either parent, and thus come to qualify as a normal individual.

The usual pedigree charts of defective stocks in which individuals are designated as either feeble-minded or normal give us in most cases an erroneous picture of the real situation. There is a strong tendency for people to choose their mates from among those on approximately their own mental level, and the individuals labeled as normal in the charts are probably mainly border-line cases who have been given too much credit for intelligence. Some types of defectives doubtless result from a single pair, or sometimes two pairs,

of recessive genes which exercise a peculiarly baneful influence in thwarting normal mental development. The relatively rare type known as amaurotic family idiocy, which is uniformly fatal in early life, is probably the result of recessive genes of this sort. But what may be termed normal feeble-mindedness represents the lower end of a series of intergrading stages which depends upon numerous combinations of factors affecting mentality. Where an individual inherits a poor collection from both sides his chance of becoming a genius is irretrievably lost. He might have the good luck to draw a combination of the best factors from both parents and therefore excel them both in native intelligence. Offspring not infrequently rise higher than their source, but they seldom if ever reach great heights if their parents are both of low mental caliber.

The precise way in which mental defect is transmitted is of secondary importance as compared with the extent to which it owes its origin to heredity. In going over the recent literature on this subject one encounters a surprising situation. Not only do we come upon many diverse opinions, but we meet with very diverse and apparently opposed findings reported by various investigators. As an illustration of one of the more extreme views we may cite the statement made by Dr. Clarkson in his "Morison Lectures on Mental Deficiency": "I have seen and talked with the parents of over 1,000 defective children, and the number of them that I would have certified as mentally defective could be counted

on my fingers." Mental deficiency, we are told, is usually spontaneous, arising from causes about which we are in almost complete ignorance. Hence Dr. Clarkson sets little store by heredity as a cause of this infirmity.

Here we have the testimony of a physician of extensive experience in an institution where he is brought into contact with thousands of defectives, and who has had exceptional opportunities for meeting the parents. Apparently the estimates of the parents' intelligence were made from more or less casual impressions gained through brief interviews. Under the circumstances, probably all that would ordinarily be noted would be whether or not the parent was obviously deficient in mentality. There is no statement concerning records made of individual interviews, so that I hope I am committing no error in concluding that Dr. Clarkson's general impressions were gained much as one might gain an impression of the intelligence of grocerymen or Pullman car porters. It might, of course, be said that the same lack of precision characterizes most of the information we possess concerning the mental status of the parents of feeble-minded children, and there would be much pertinency in the reply. Where a person is acknowledged by his associates to be mentally defective, however, there is generally pretty good ground for the opinion. But the border-line class is likely to be rated as normal, and there is a good deal of evidence

that a large proportion of the feeble-minded come from so-called normal people of subnormal mentality.

According to a report by Dr. A. C. Williams on the mentally deficient pupils in the special schools of London (1930), the percentage of mental defectives in the parents was relatively low. A rough classification of the mental grades of the parents gave the following percentages: superior, or above average ability, 15 per cent; average ability, 45 per cent; inferior ability, 28 per cent; mentally defective, 4 per cent—which is a distribution not far from that of the rank and file of the population. Dr. Shrubsall in his study of 1,360 mentally defective children of London found that 9.5 per cent had one or more mentally defective siblings. The percentage of imbeciles with mentally defective siblings was lower, viz., 5.7, and that of the idiots lower still, viz., 4.3. The 2,000 ex-pupils of the special schools who, being educable, were of a somewhat higher grade, were found to have 13 per cent of siblings who were classed as mentally defective. It is an interesting fact, illustrated also by the results of other studies, that the lowest types of defectives have fewer defective siblings than the defectives of a higher grade.

In the light of the foregoing findings it would appear that mental defect of the kind that is certified as such in London runs in families to only a moderate extent. The environmentalist, therefore, might well be gratified by the results of these particular investigations. But we must consider some other attacks upon

the same problem. In Dr. Lokay's study of the pedigrees of 82 imbeciles at the University Clinic at Munich an effort was made to separate those cases in which the imbecility was of endogenous origin from the cases in which it was presumably due to environmental, or exogamous, factors, there being 57 in the former group and 25 in the latter. Among the so-called exogamous cases there was no instance in which the mental defect could certainly be traced to any single factor, but there was suspicion of such causation in the cases showing trauma (5), difficult delivery (8), encephalitis or cerebral inflammation (6), and possible congenital syphilis (6), although all of these gave a negative Wassermann reaction. It is not improbable, therefore, that, as Lokay states, these 25 cases included several in which the defect was really of hereditary origin. Of the entire group, 12.66 per cent of the parents were found to be mentally defective as determined by personal visits, the records of former teachers, and such other means as could be employed. It is of interest that the percentage of defective parentage (8) for the lowest grades of imbeciles was lower than for the less defective types. Where one of the parents was defective and the other normal, 33 per cent of the siblings were feeble-minded, and where both parents were normal, 13 per cent of the siblings were feeble-minded. There was only one family in which both of the parents were feeble-minded and in this instance all of the five children that escaped dying in infancy were feeble-minded also.

Let us take another study more or less comparable to the investigation of the pupils in the special schools of London. In their study of the children attending the special schools of Rostock, Reiter and Osthoff took as a starting-point 400 mentally defective children concerning whose families fairly satisfactory information could be secured, and then proceeded to ascertain the mental condition of the parents and siblings. Visits were made to the 250 families living in Rostock, and all available means were employed to gauge the mental condition of the parents. Out of the 250 families visited, the father showed pronounced mental defect in 60, or 24 per cent, of the cases; the mother was rated as mentally defective in 80, or 32 per cent, of the cases; and in 11.6 per cent of the families mental defect was found in both parents. Altogether, 67.6 per cent of the mentally defective children had one or both parents in the mentally defective class. In 42, or 16.8 per cent, of the parents the mental condition had to remain undecided on account of inadequate data. In 39, or 15.6 per cent of the cases, the parents gave every indication of being normal. The feeble-minded children of illegitimate origin proved to have mothers who were feeble-minded in 25 out of 29 cases, whereas only 5 of the fathers were defectives. From this investigation one might conclude that perhaps most feeble-minded children came from feeble-minded parents, and that in many other instances they may have derived their defect from more remote ancestors.

In the *Eugenics Review* for January, 1933, Dr. R. J. A. Berry, the director of medical services in an institution for mental defectives in Bristol, England, reports on a study of 165 cases of mental defect in which he was able to secure records of the parents' intelligence. The parents were divided into three classes. In the first, consisting of 15 cases, or 9.1 per cent of the group, they were reported as of normal mentality. The second group of 51 cases, or 30.9 per cent, included parents who were mentally weak, but not certifiable, or else they were criminals, or had mentally abnormal brothers or sisters. The parents in the third group, 99 in number, or 60 per cent, were one or both "definitely of defective or insane mentality." Several instructive case histories are given in Dr. Berry's article, of which I quote only two:

EXAMPLE 5. Microcephalic, medium-grade feeble-minded. Chronological age 34.1 years. Binet mental ratio 8.7. Porteus 9 years. . . . Cannot tell the time or give correct change.

FAMILY HISTORY. Father a fireman. Mother an inmate of the Frome Road House Imbecile Ward, Bath.

EXAMPLE 6. Microcephalic, low-grade feeble-minded. Chronological age 11.11 years. Binet mental ratio 6.10 years.

FAMILY HISTORY. Mother sub-normal, mentally, physically and morally. Unmarried. Has five illegitimate children, all of whom are imbeciles and three are notified by the L.E.A. as such. Mother has two sisters, one of whom is feeble-minded, and the other has two illegitimate children.

Dr. Berry states that "there are no fewer than 50 families represented by either two or three defective

children." He is very positive that heredity is a factor of overwhelming importance in the production of mental deficiency.

The same number of the *Eugenics Review* contains an article on mental deficiency by Dr. L. S. Penrose, the medical officer of the Royal Eastern Counties' Institute for Mental Defectives. Dr. Penrose has made an analysis of one hundred families containing what he calls subcultural mental defectives. All these were certified, but they did not include the more pathological types, but rather those "who represent the lower part of the frequency distribution curve of intelligence for the general population." Their families were all investigated personally and were grouped in four classes as superior, normal, dull, and mentally deficient. "Unfortunately," says Dr. Penrose, "it was not possible to measure the intelligence of many of these families by standardized mental tests. Great attention was, however, paid to schoolmaster's reports, and these were compared with estimates given by relatives, employers, friends and others." Apparently, therefore, the judgments of the parents' intelligence should be more reliable than those found in most studies of this kind. We may best express the general results in the form of a table as follows:

MATINGS OF PARENTS	CHARACTER OF OFFSPRING		
	Normal	*Dull*	*Mentally Deficient*
Superior X Superior (45)	126	13	49
Superior X Dull (18)	36	20	24
Superior X Defective (12)	11	14	20
Dull X Dull (9)	8	12	17
Dull X Defective (9)	0	1	12
Defective X Defective (7)	1	3	18

(In the superior group are comprised both the superior and the normal parents. The number of matings in each class is indicated by the figures in parentheses.)

These are very striking facts. Note that the 7 matings between mentally defective parents gave rise to 18 mental defectives, 3 dull offspring, and only 1 that was considered normal, whereas the majority of the offspring of normal parents are also normal, although each family comes into the picture only because it contains at least one mentally defective child.

Perhaps we have now given sufficient illustrations of the varied results of investigations on the hereditary transmission of mental defect. In face of these extraordinary disagreements the reader may well be filled with dismay, and be disposed to look upon all the findings with profound distrust. I am convinced, however, that from the scientific standpoint the situation is not nearly so bad as it looks, and that the divergent results which have been reported are susceptible of a fairly simple explanation.

One very potent cause of the varied findings is the different standards employed in adjudging a person mentally defective, and especially in estimating the intelligence of parents where reliance is placed on subjective impressions, hearsay evidence, and any other items of evidence that may haply be secured. It must be borne in mind that the frequency curve representing the grades of mental ability rises very rapidly near the dividing line between defective and so-called normal people, and hence a relatively small increase in the breadth of the defective class would cause it to include a disproportionately larger number of individuals. It is evident, therefore, that estimates of mental capacity made in the usual loose way would give widely variable results. Dr. Smith, for instance, in evaluating the mental capacities of the parents of one thousand defective children might find 10 per cent of them feeble-minded, while Dr. Jones in going over the same group might find the proportion of feeble-minded parents as high as 40 per cent. I doubt if estimates would ordinarily differ so greatly as this, but I cannot help wondering what results would be reported if Dr. Berry were to examine the parents whom Dr. Clarkson considered to be so free from defect, and if Dr. Clarkson were to examine the parents whom Dr. Berry found to be so heavily laden with mental weakness and abnormality. If these gentlemen could exchange places and carry out this experiment, the results, I feel sure, would be very instructive. The findings, which I suspect would be quite diver-

gent, would be considerably increased in scientific value if each investigator were to give the basis of his classification in each case. Dr. Clarkson's group would probably be found to have a relatively narrow base, for he remarks that the parents whom he would be willing to certify as mentally defective could be counted on his fingers. Now in Great Britain an adult individual whom a cautious doctor would take the responsibility of certifying as a mental defective must be of a pretty low order of mentality. Certainly the great majority of people with an I.Q. of 60 to 75 are not so certified in Great Britain or anywhere else. Where one goes beyond the relatively low group who are certifiable as mental defectives according to the usual standards, and takes in the high-grade morons and border-line cases, the number of persons ranked as mentally deficient is enormously increased. We can understand, therefore, how two conscientious and competent investigators might report very different results in a study of this kind. For the sake of ascertaining the true rôle of heredity a plausible argument might be advanced for the employment of a more inclusive category of feeble-mindedness. If a feeble-minded child is born to parents who would not be formally adjudged mentally defective, but who are nevertheless of very low intelligence, say with an I.Q. of 65 to 70, it would be rather misleading to class them as normal instead of feeble-minded.

Another significant circumstance in this connection is

that the proportion of mental defectives found among parents depends also upon the standards used in classifying the offspring. This is on account of the fact previously noted that idiots and imbeciles are more apt to come from normal parents than are the feeble-minded offspring of a higher grade. Characters that are highly deleterious are apt to be more completely recessive than those which are partly dominant. Such a fatal defect as amaurotic family idiocy probably owes its continuation to its complete recessiveness, for had it been dominant, or even partly dominant, it would have been eliminated long ago through the action of natural selection. There are some fairly specific recessive types of idiocy and imbecility which seem to stand outside the ordinary graded stages of mental levels. The continuous variations in native intelligence probably represent the result of numerous combinations of factors affecting the development of the mind, and it is quite gratuitous to assume that all those making for mental inferiority are completely recessive. Some of them, for all that we know, may be dominant. While there is a good deal of variability in the offspring of intelligent parents, mental heredity does not usually appear to be of so sharply alternative a type as that exhibited by certain forms of idiocy and imbecility. It seems to approach heredity of the blending kind that is commonly found in the transmission of size. Parents near the lower end of the mental scale, therefore, are apt to produce children not far from their own mental level,

whereas the more pathological kinds of defectives are not infrequently born to parents of almost any degree of intelligence. If then we were to start with a group of defectives of a low order, we would be apt to find fewer defectives among their parents than if our group consisted of the higher grades of the feeble-minded. This fact is borne out by the findings of the Mental Deficiency Committee, the studies of Lokay, and those of Shrubsall on the mental defectives in the special schools of London. Since institutions for defectives differ considerably in the average mental level of their inmates, we have another factor causing variable proportions of defectives among the parents of defective children.

The higher grades of mental defect tend to run in families to a greater extent than the lower types, but we must emphasize the fact once more that the frequency with which a trait occurs in families is not necessarily an index of the degree to which it is caused by heredity. A dominant character usually runs in families to a greater degree than a recessive trait, and if the recessive trait is very rare it may not appear to run in families at all. If 95 per cent of feeble-minded children should have normal or even highly intelligent parents, it would not follow that they did not inherit their low mentality. This fact is strikingly illustrated by the fine study recently made by Sjögren on a large group of rather low-grade mental defectives in northern Sweden. Nearly all the afflicted children belonged

to a clearly defined type. Most of them were unable to learn to read or write, and the few exceptions succeeded in learning to read only in a very imperfect manner. They could be taught to perform only the simplest tasks, and they spoke indistinctly and usually in monosyllables. Their intelligence corresponded with that of children from three to six years of age. Two or more of these defectives often occurred in a single family along with normal brothers and sisters, but in no single instance out of the 48 cases belonging to one large group of interrelated families was there a single defective parent or grandparent. The physical development of the defectives was, as a rule, good. Wassermann tests were made on 29 cases belonging to 25 families, and other tests were carried out on 10 others, with negative results in every instance. It was quite clear that the defect was a recessive hereditary trait, but on account of their very low mentality the individuals who inherited it did not pass it on.

In proportion as an institution contains defectives of such a type as this, in that proportion we would find a small percentage of mental defects among the parents of the inmates. We might expect, therefore, that institutions would vary considerably in this respect according to the types of defectives prevailing in their vicinity. Hence, for this as well as for other reasons we have discussed, the varied reports on the familial distribution of mental defect may not be so hopelessly opposed as they may have appeared.

Much light on the genetics of feeble-mindedness has recently been thrown by a study of mental defect in identical and fraternal twins. Since identical twins have the same heredity, it would be expected that they would be more alike in their mental development than fraternal twins, whose resemblance would correspond more nearly to that of ordinary brothers or sisters. So far as investigation has now gone, this expectation has been realized in a very striking manner. According to Luxenburger, who has compiled the results of investigations on mental defects in twins up to 1930, there were 11 cases of feeble-mindedness occurring in identical twins, and in 10 of these both members were affected in a similar manner. Where feeble-mindedness occurred in twins known to be fraternal, it was limited to one member of the pair in all the 4 recorded cases. There were 6 instances in which the diagnosis for identity was not decided and in which both kinds of twins were probably included, and of these both members were feeble-minded in 4 of the pairs. Von Verschuer has reported on 6 pairs of identical twins and an equal number of fraternal twins with mental deficiency, and in each group both members of the pair were similarly affected in 5 out of 6 cases, but the mental symptoms were much more similar in the identical pairs. In the one discordant pair of identical twins the birth was premature and one member was microcephalic, due, according to Von Verschuer, to faulty development.

In Denmark J. C. Smith has found mental defect in

66 pairs of twins among the 6,700 registered mental defectives of that country. In the 16 pairs of identical twins there were 14 cases in which both were feeble-minded, and 2 in which the defect was limited to one member of the pair. In these 2 cases one twin may have been made feeble-minded as a result of birth injury or some other extraneous cause. In 15 pairs of like-sexed fraternal twins the mental development of the two members was different in 14 cases, and very similar in both members of only one pair. The proportion of like and unlike cases in twins of different sexes was much the same as in the like-sexed fraternals, namely, 3 like and 32 unlike.

Additional cases recently collected, mainly by Dr. Rosanoff in California, and reported by Humm, tell much the same kind of a story. Among the 32 identical twins, both members were mentally defective in 31 cases, and in 30 of these the defect was of a similar type in both. Among the ordinary twins of the same sex, both members were feeble-minded in 14 pairs; in 5 others both were mental defectives, but of dissimilar type; and in 13 pairs one member was feeble-minded and the other normal. Of the opposite-sexed twins there were 7 pairs with similar mental defects, 4 pairs with mental defect of a dissimilar kind, and 14 pairs in which one member only was a mental defective.

In the light of the foregoing evidence the potency of heredity in causing mental defect is scarcely open to doubt. At the same time, this evidence shows that

environment is probably responsible for the production of a relatively small number of feeble-minded children. It might be claimed that the reason why identical twins are more nearly alike in mental development than fraternal twins is because they are subjected to more nearly similar environmental influences. Dr. Paul Wilson has shown by a fairly extensive inductive study that identical twins are less frequently separated, dress more nearly alike, have more often the same friends, and are found more in the same grades and classes in school than occurs with fraternal twins of the same sex. That any of these differences could make one child feeble-minded while the other remained normal is wildly improbable. The attempt to explain these differences as due to the intrauterine environment is no more successful. In fact, the evidence points to the occurrence of more interference during development among identical twins than among fraternal twins, owing to their closer association in the same embryonic membranes.

The environmental explanation, improbable as it is, meets with an insuperable difficulty in the fact that intrapair differences among fraternal twins of the same sex are much more nearly comparable to those of twins of the opposite sex than to those of identical twins. Boys and girls of the same age are subjected to conditions of life which are more different than those ordinarily encountered by twins of like sex, a fact which is abundantly confirmed by the investigation of Dr. Wilson. Nevertheless, the decided cleavage in the twin

group is between identical twins and fraternal twins, whether or not the latter are of the same or of opposite sex.

We have in these twin differences what essentially corresponds to an experiment of Nature on the vexed question of the relative influence of heredity and environment on the development of the individual. The general outcome is that in most cases mental defect is the result of the shuffling and the sorting of the genes.

Any. Pedigree Schedule.

CHAPTER III

The Heredity of Superior Ability

OF all the matters that concern the eugenist the inheritance of mental ability is unquestionably the most vital. Most of what is written on eugenics would have little significance if mental qualities were not transmitted. But even though heredity were limited to purely physical characteristics, it is obvious that eugenics would still be a subject of great practical importance because it holds out the possibility of ridding humanity of a large part of its burden of hereditary defect and producing a healthy and vigorous race. This would be a great gain even if man were destined to remain forever on his present modest level of intellectual development.

Whatever may be the precise relation between mind and body—and we leave this much discussed question to the psychologists and metaphysicians—the relationship is certainly very intimate. In the animal world mind varies with the type of physical organization, and in man, as in all sentient beings, it varies concomitantly with bodily changes. It is scarcely conceivable, therefore, that the body could undergo hereditary modifications without entailing some corresponding changes

in the mind. The more intimately mind and body are associated, the greater the antecedent probability that the laws of inheritance apply alike to both. According to most of the more widely accepted theories of the relationship of physical and mental phenomena, the applicability of the principles of heredity to the mind follows of necessity.

Even in the present imperfect state of human genetics there can be no reason to doubt that the mental differences between human beings are to a large extent due to varied combinations of hereditary factors. Nature shuffles and parcels out the genes, and the particular combination which an individual draws out of the parental store is a matter of just sheer luck. He may be an amaurotic idiot and perish in infancy, or he may make a drawing which will cause him to become greater than Newton or Shakespeare. But his chances of receiving a favorable combination are strictly limited by the genes carried in the germ plasm of his two parents. If both his parents have a poor lot to draw from he may get a combination better than that possessed by either parent, but very much inferior to what might be drawn if he had other parents from whom to derive his genes. He might also be much worse off than either parent if he drew from each certain recessive genes whose baneful influence had been held in check by their normal companions.

When one has drawn his allotment of genes he may swagger all he pleases about being master of his fate

and captain of his soul, but the goddess Fortune presides over his heredity. In contemplating the distribution of hereditary gifts one can hardly fail to be shocked at the frivolous way in which the functions of this capricious goddess are discharged. Doubtless many persons would be scandalized, as Thomas Carlyle would be were he alive, at the suggestion that the basis of genius is furnished by the fortuitous concourse of genes. A really great man is often regarded as a phenomenon standing apart from the ordinary course of events. His origin is enshrouded in mystery as if it were something upon which mere science has nothing to say. Nevertheless, the impious geneticist has endeavored to interpret him, at least so far as his native endowments are concerned, as quite as much the product of his assortment of genes as is the low-grade moron near the other end of the scale of mental development.

The pioneer in the scientific study of the genetics of genius was Francis Galton. In his important work *Hereditary Genius,* Galton showed that superior mental ability exhibits a strong tendency to run in families. This conclusion was so firmly established by impartial statistical methods that even the most captious critic has had to admit the cogency of the evidence. Galton's critics, however, explained the frequency of ability in certain stocks by attributing it to the influence of an environment especially favorable for mental achievement. Doubtless the home environment in such families as the De Candolles, Gregorys, and Balfours was much

more conducive to intellectual development than that of the slums of East London. Although Galton set great store by heredity, he admitted, as everyone must, that opportunity has to be afforded if an individual is to achieve any noteworthy measure of success in intellectual pursuits. "I acknowledge freely," says Galton, "the great power of education and social influences in developing the active powers of the mind, just as I acknowledge the effect of use in developing the muscles of a blacksmith's arm, and no further."

Although Galton was the first to do systematic scientific work on the inheritance of mental ability, his judicious and penetrating discussion of the subject has never been excelled. His description of the constitutional limitations of human capacity is one which experience has forced most of us to admit is peculiarly applicable to his own case:

"Everybody who has trained himself to physical exercises discovers the extent of his muscular powers to a nicety. When he begins to walk, to row, to use the dumb bells, or to run, he finds to his great delight that his thews strengthen, and his endurance of fatigue increases day after day. So long as he is a novice, he perhaps flatters himself there is hardly an assignable limit to the education of his muscles; but the daily gain is soon discovered to diminish, and at last it vanishes altogether. His maximum performance becomes a rigidly determinate quantity. . . . This is precisely analogous to the experience that every student has had of the

working of his mental powers. The eager boy, when he first goes to school and confronts intellectual difficulties, is astonished at his progress. He glories in his newly-developed mental grip and growing capacity for application, and, it may be, fondly believes it to be within his reach to become one of the heroes who have left their mark upon the history of the world. . . . When he reaches mature life, he is confident only within certain limits, and knows, or ought to know, himself just as he is probably judged of by the world, with all his unmistakable weakness and all his undeniable strength."

No reasonable person who has acquired the normal, sobering experiences of life can fail to appreciate the truth of Galton's remarks. In the course of our intellectual development we all come sooner or later to our *pons asinorum* which we are unable to cross. For some this may be the work of the fifth grade of school, for others it may be the course in high-school algebra or the integral calculus. How many people try and try in vain to understand Kant's *Critique of Pure Reason*, or the theory of relativity, getting an encouraging glimmer of an idea or a very hazy general conception now and then which spurs them on and affords a certain solace for their baffled efforts. We all seem to be creatures of a kind or an unkind fate that has assigned to us definite limitations which no art will enable us to transcend. What determines these limitations? Accord-

ing to Galton, it is heredity, or, as we would now interpret it, the combination of one's genes.

The investigations of Galton effectually disposed of the common error that the sons of great men are rarely distinguished for superior intelligence. When we pick out one man in a million on the basis of eminence it is scarcely to be expected that his sons will measure up to the same high standard. What an individual inherits from his mother's side would probably reduce his endowments somewhat unless his mother's intelligence was on the same high level as that of his father. Then the grandfathers and grandmothers and still more remote ancestors have a finger in the pie also. According to Galton's law of ancestral heredity, an individual derives, on the average, only one-fourth of his qualities from any one parent, the rest coming from the other parent and more remote ancestors. Everything that we know about genetics leads us to expect that the peculiar inheritance of any individual would not be precisely repeated in two successive generations. If there is exceptionally good intelligence on both sides, as there not infrequently is in distinguished stocks, the intellectual development of the offspring is apt to be on a high level also, but it will be different from what is found in either parent. One striking fact revealed by studying the genealogy of great men is the frequency with which high intelligence appears in the stock of the mother as well as in that of the father. A considerable proportion of the distinguished minds in any country comes from a

relatively few family strains. Most people are incapable of attaining the intellectual stature which commonly occurs in many of these stocks. Nurture therefore fails to explain the fact that genius tends to run in families.

Any study of the inheritance of a trait which varies in a continuous manner must be based on some measure, however crude, of the different degrees in which that trait is manifested. In his studies Galton used reputation for intellectual achievement as a measure of mental power. The investigations of Karl Pearson and his colleagues were based on scholastic records in schools and colleges. The measures of the resemblance between members of a family, in some cases fathers and sons, and in other cases siblings, were expressed in terms of coefficients of correlation. A coefficient of correlation, it may be explained, is a mathematical expression for the degree to which two things tend to vary in the same direction. It is expressed by some fraction of 1. The usual correlations between parents and offspring for physical traits average approximately 0.5, 1 being perfect correlation. It is a significant fact that the similarities in mental achievements of members of a family were found by Pearson and several later workers to be about 0.4 to 0.5, although some distinctly lower correlations have also been reported. On the basis of his findings Pearson argues that mental traits are inherited to about the same degree as physical traits. Of course the environmentalists can make, and in fact have made, the same objection to this conclusion as was urged

against the generalizations of Galton. What is proved in both cases is the tendency of mental ability as indicated by achievement to run in families. But why? Here is the bone of contention.

An attempt to avoid the difficulties occasioned by great differences in environment in different stocks was made by Dr. F. A. Woods in his book *Heredity in Royalty*. In royal families, it was assumed, one does not meet with the inequalities of opportunity created by poverty and the lack of educational advantages that are so conspicuous in the general population. Nevertheless royal families differ markedly in their reputation for intellectual power. The superior ability characterizing certain stocks such as the Hohenzollerns contrasts sharply with the dullness manifested by the members of the House of Hanover. Woods found that the correlation between parents and offspring for mental ability was approximately 0.30, which is not quite so high as it is among other groups in which environmental influences are presumably much more effective. Even in royalty, however, one does not get away entirely from the unequal effects of environment and training, but the environmentalist's interpretation of the peculiar distribution of mental ability in royal families seems weak and forced as compared with the explanation offered by Dr. Woods.

With the advent of mental tests contributions on the relative rôles of nature and nurture in mental development have greatly increased in number. Educators were

delighted with the opportunity thus afforded for doing some real inductive research, and now some millions of school children have been tested and retested in a variety of ways. A large part of this work, it is to be feared, has served no better purpose than keeping a number of ambitious individuals busy, and perhaps adding to their local reputation. Nevertheless quite a little real grain has been secured along with much chaff, and as the problems have become more clearly defined and the technique of testing perfected, the results are coming to have greater scientific value.

From the nature of the case one cannot expect to secure a complete divorcement of two such intimately associated functions as inherited ability and acquired knowledge. Every mental test presupposes some information. There are, however, certain kinds of knowledge which every intelligent person acquires. An adult person who is unable to tell the time of day is almost certainly a low-grade moron, or worse. Mental tests may be devised which involve no more knowledge than that which every normal person can hardly fail to possess. Unfortunately most of the tests require a considerable measure of mere information, and hence are faulty as indices of native intelligence.

Again, the ability to pass a mental test depends upon the subject's previous experience with problems similar to those upon which the test is made. It has been shown that test scores are improved by practice, but the amount of gain made varies greatly with the test used

and the age and intelligence of the subject. The improvement, however, falls off rapidly after the second attempt, and after three or four trials it reaches a practically constant level. In order to eliminate the effects of previous experience, therefore, individuals should be tested two or more times before their mental rating can be adequately gauged.

Various other factors may also influence a subject's score, i.e., state of health, fatigue, emotional attitudes, the personality of the teacher, and the environment in which the test is conducted. All this is inevitable in any method of measuring ability that may conceivably be devised. The effort to gauge intellectual development with the accuracy of measurements of height or weight is of necessity a hopeless task.

Notwithstanding this fact, mental tests have proved very useful aids in grading human beings according to their different levels of intelligence. There are several ways of testing the tests, and the results show that many tests have a high degree of validity. As an index of a student's future scholastic performance, or an applicant's probable success in a given occupation, a mental test is often as safe a guide as any other kind of examination. What is particularly significant is that the different tests of ability show a considerable degree of agreement. On the whole, they give us a means of estimating the mental powers of human beings that is comparable in value to any of the methods previously employed.

When children of the same family are tested their scores show much the same correlation as those based on scholastic records. Pintner, for instance, in a study of the mental indices of 180 pairs of siblings found a correlation of 0.39. Rensch found in 365 pairs of siblings a correlation of 0.45. The study of Wilcocks on 365 pairs of siblings who had been exposed to quite different environments yielded a correlation of 0.5 in spite of their varied surroundings.

One of the most striking results growing out of a large amount of mental testing is that mental power, as contrasted with information and the development of special aptitudes, does not increase sensibly after sixteen to eighteen years of age. Mental growth shows a remarkable parallelism to physical growth. Consequently it probably represents the result of changes occurring in the physical organism as a result of its development. A child of ten is more intelligent than a child of five, not so much on account of its greater accumulation of experiences as because of the maturing of the brain and general physical constitution. The old experience psychology which regarded the mind as beginning in a blank and being built up by the gradual organization of experiences has had its day. The factors responsible for the growth of the intellect, like those causing the growth of the body, are largely internal. Of course, in the growth of both mind and body the environment is essential, but mere experience without the maturation of the brain would accomplish little. If

intelligence were mainly the product of mental activity it would naturally continue to increase as experiences accumulate. Why this mysterious halt in the development of intellectual power at age sixteen to eighteen? There is no reasonable answer except that it is the result of the inherited constitution of the individual, which causes the attainment of physical maturity at about the same age.

Another very important fact which is borne out by the results of many investigations is that the intelligence quotient of an individual remains fairly constant from childhood to adult age. Whether one starts with superior, average, or inferior children it is found that, as a rule, the intelligence quotient remains practically the same, at least for several years. If a young child is stupid it almost always remains stupid. In retesting a group of 441 imbeciles after an interval of two to ten years Minogue found that there was practically no change in I.Q. (less than 5 points) in 72 per cent of the cases, and only 9.1 per cent varied more than 10 points. Instead of increasing, the I.Q. showed a tendency to fall, 23.6 per cent showing a drop and only 4.8 per cent showing a rise. There was a high percentage of insanity, epilepsy, and amentia in the parents of these children.

In her efforts to increase the intelligence of mentally defective girls over sixteen years of age by giving them special training in reading and other book work, Miss Otis found that the scores of the girls in the Stanford-

Binet test increased somewhat "due more to changes in vocabulary score and understanding than to changes in memory span or reasoning ability. . . . The gain in the reasoning test could not be estimated, for . . . there is hardly any success in these reasoning tests for any of the 40 girls. . . . If the reasoning ability is absent there seems to be no way of training it in."

It has been generally recognized that the outlook for the mentally defective child is far from hopeful. The precocious child, however, has the reputation of being a sort of anomaly who rarely fulfills his early promise. By no means all precocious children turn out to be geniuses, but they usually maintain their position of superiority in later life. High I.Q.'s are as constant as low ones. The several studies in which children of superior intelligence have been kept under observation through several years have shown that the current notion that their precocity is only a temporary efflorescence is without foundation in fact. Let us glance briefly at some of the results of these studies.

Duff has compared the progress of a group of 73 very intelligent English students, whose I.Q., determined in 1921-22, was 136 or over, with that of a group of controls having an average I.Q. of 100. The students with a high I.Q. were doing excellent work in the school; a larger percentage than in the controls had gone on to the secondary school; and 55 per cent won prizes, whereas no prize was won by the controls except one for attendance. Some of the intelligent group did

not go on to the secondary schools, and a comparison was made of their development with that of the controls who had gone to secondary schools. The intelligent group not in secondary schools was found to excel the controls in spelling, adequacy of expression, quality and quantity of reading, and in ambition. Of the control group none passed the school certificate and only one reached the stage of attempting it, whereas out of the intelligent group in secondary schools 30 passed the certificate, 7 failed; 10 changed schools; 2 were too young to try the examination; and 2 were lost from the record.

Passing over other studies which have yielded essentially similar results, we may refer to the rather striking case of a precocious boy who for the sake of concealing his identity was designated as E. At eight years of age E was given the Stanford-Binet test by L. S. Hollingworth and made the remarkable score of 187. He was then doing superior work in the sixth grade of school. Ten years later E made a score of 441 in a test in which the median score attained by college graduates was 415, the best grades made by graduates being about 440 points. E graduated with honors, won Phi Beta Kappa, and took his degree of M.A. when he was not quite sixteen. Incidentally we may remark that the parents of E were both graduates of more than ordinary distinction.

The most extensive investigation of the development of gifted children has been made by Dr. L. M. Terman

and his associates on one thousand pupils in California schools who made a score of 140 or higher at the time of their selection. Grades as high as this are attained by less than one-half of 1 per cent of the school population. Careful and continuous studies were made on the physical characteristics, health, home surroundings, emotional reactions, scholarship, and social adaptability of these children, and as much information as could be gained concerning their early history was secured from the parents. The children were in general of good vitality, interested in sports, socially adaptable, and often leaders in school activities. They were by no means the one-sided freaks that precocious children are so commonly regarded as being. They were just normal, healthy, intelligent youngsters. As a rule they did well in a variety of subjects, thus exhibiting a general rather than a special type of ability. Their advantages in school were no better than those of their associates. In fact, they received less attention than the dullards, as superior children usually do. Most of them showed superiority in their preschool years, and in some cases they were helped more at home and received more instruction than the ordinary child, but there was nothing in their home environment that gave any reasonable explanation of their superiority.

The latest contribution to the study of these gifted children is a rather large volume by Burks, Jensen, and Terman containing the results of a follow-up study of as many children as were available out of the original

thousand. The scholastic performances of these children fully justified the early promise of the group. "Subject failures in high school are practically never incurred by children of this grade of intelligence," and "nearly three-fourths of the total marks earned in high school by gifted girls, and nearly one half of those earned by gifted boys are of the 'A' grade." Those who have gone through high-grade universities won Phi Beta Kappa and other graduating honors three times as frequently as did ordinary students.

There were a few failures in the gifted group. One erratic boy stole an automobile and was sent to a reform school. Another boy with abnormal heredity and a broken home committed suicide, and the conduct of a few others, it must be confessed, was not quite what it should be; but on the whole the behavior of the gifted group was very creditable. Several have exhibited remarkable talents and achieved a rather striking success. Whether any great genius will emerge from the group cannot be predicted at this early date.

As might have been anticipated, a study of the ancestry of these gifted children was not neglected. The fathers were found to be engaged in pursuits requiring more than average mental ability. The largest proportion of them came from the professional classes. Several were business men. A smaller number were skilled artisans, while less than 1 per cent were unskilled laborers. In the ancestry of the parents were many noteworthy names of English and American history. And

most remarkable of all is the fact that nearly one-fourth of the names in the Hall of Fame were found in the ancestry of this group!

A study in several ways complementary to the preceding one has been made by Dr. C. M. Cox on the early life of men and women who have made a record for distinguished intellectual achievement. The endeavor to find what distinguished people were like when they were children involved a ransacking of a large number of biographical sources. Information on this subject is for the most part rather scanty and scattered, but the general conclusion that is supported by the mass of data which Dr. Cox has succeeded in assembling is that great men come from children who at an early age manifested unmistakable signs of superior intelligence. Great men do *not* come from dull boys. Not only can we say, Once stupid always stupid, but, Once intelligent, always intelligent, barring of course some untoward circumstance, such as a blow on the head or the peculiar influence of disease, which might make an imbecile out of anyone.

The general upshot of these and other investigations is that, when adequately tested, the I.Q. is fairly constant through the years. Every teacher has abundant opportunity to learn that nothing is more hopeless than the effort to infuse intelligence into certain heads. He knows that the bright students continue to be bright, and that the dull ones do not get over being dull. "*Gegen die Dummheit kämpfen die Götter selbst*

vergebens." Undoubtedly the I.Q. does change somewhat, but there is no art by which an individual with an I.Q. of 80 can be converted into one with an I.Q. of 140.

That marked differences in intelligence are the product of differences in schooling is now a pretty well discredited notion. In their efforts to explain why Annie is so much more clever than her sister Julia the egalitarians have now come to stress the overwhelming importance of the preschool years of life. The nature-nurture controversy is thus carried back into the presumably very impressionable period of early childhood. It is then, we are told, that the plastic mind of the child gets a set, or bent, that may determine its whole future development. We should devote very special care, therefore, to this early formative period of life. What these early influences are which are supposed to have so potent an influence upon the child's I.Q. is a bit uncertain. So long as a young child is adequately fed and lives in a wholesome environment with sufficient variety of things to play with, it is difficult to see what great advantages it would receive in the home atmosphere of a Lord Chancellor that are not supplied in the humble dwelling of a day laborer.

Undoubtedly the period of early life is especially important in the development of habits and traits of character. All this, in principle at least, was well known to our grandmothers. But while it is a notorious fact

that even very young children can be spoiled, there is not a shred of good evidence that any kind of treatment can greatly increase their mental power. It is possible to raise the I.Q. of a child somewhat by special training, but as a rule the gains are of a very modest order. The one fact that stands out prominently as shown by a vast amount of psychological research is that environment has its very distinct limitations in the creation of brains. For the most part intelligence comes by the grace of God, or, if one prefers, from the collocation of the genes. If it is not inherited, the endeavor to supply it has little chance of meeting with conspicuous success.

The work of the mental testers has been by no means lacking in hostile critics. There is a looseness about the whole business that is particularly irritating to a person of strict scientific training, but those who unreservedly condemn this work impress me as lacking in insight and balanced judgment. Many of those who are the most active in mental measurement are fully alive to the shortcomings of their methods and the indefinite nature of their results. No one can attain great accuracy in linear measurements with no better measure than an elastic rubber cord, but even with this crude instrument one might make a useful record of the difference in height between a dwarf and a giant, or even the average differences in height between Italians and Norwegians. Although mental measurements may be even less pre-

cise than such measurements of height, they have demonstrated their practical value in many ways.

Consider, for instance, the results of mental measurements in Cobb and Hollingworth's studies of the siblings of children testing from 135 to 190. There is not the least doubt that these children were unusually intelligent, if this term means anything at all. The average grade of the siblings of these children was 129 with a range from 96 to 173. The siblings of the children with a grade of over 150 averaged 132.8, while the siblings of the children testing from 135 to 150 averaged 124. Thirty cousins gave an average score of 127. Is this superiority due to heredity or to environment? We may admit a considerable margin of error in these measurements, but notwithstanding this, the figures mean something very real. The environmentalist has never shown that the production of intelligence of this order out of average mentality is even possible. On the other hand, even greater differences in intelligence are characteristic of family strains. We have our families of imbeciles and morons, and our families of Balfours, Bernouillis, and Darwins. When it can be shown that the moron of moron parentage can be made into an individual with an I.Q. of 140 and that this sort of thing can happen right along whenever conditions are propitious, I shall consider seriously joining the ranks of the egalitarians. As the evidence in the case accumulates, the position of the extreme environmentalist becomes more and more untenable. One may concede to

the environment a generous measure of influence in the development of intelligence without affecting the validity of the conclusion that the mental differences among our fellow creatures are largely the product of their allotments of genes.

CHAPTER IV

The Sources of the Birth Supply

IN the preceding chapters we have been chiefly concerned with the diverse kinds of human heredity. If I have been in any small degree successful in my efforts, the reader should have some appreciation of the remarkably varied hereditary endowments of his fellow creatures. He should also have some realization of the tremendous importance of heredity for human welfare. A society bred from the best 25 per cent of its hereditary stocks would in the course of a few generations be vastly superior to a society bred from the poorest 25 per cent. With the capacity for either rapid improvement or rapid degeneration which is due to the exceedingly heterogeneous nature of human populations, it should be a matter of paramount concern that the race be recruited more from its better instead of its poorer hereditary types. Whether we advance or go backwards depends upon what kinds of people survive and propagate at the most rapid rate. Or to put the matter into a very simple formula, the direction of evolution is determined by the balance of births and deaths. Neither a high birth rate alone nor a low death rate alone will necessarily result in an increase of numbers.

What counts is the net survival rate. The human types that are destined to survive and inherit the earth are those which have the largest number of babies who live until the reproductive period of life.

In this chapter we shall consider the relative reproductive rates of different hereditary stocks, for these constitute the most important single factor in modifying the biological qualities of the human species. The ministrations of death, or in other words natural selection (in a restricted sense of this term), will be considered in a later chapter.

The differential birth rate is influenced by a number of subsidiary factors. One of these is sexual selection, or choice in mating. In his *Descent of Man*, Darwin attempted to show that sexual selection has had much to do in the evolution of the secondary sexual characters of the human species. It still continues to play an important rôle. Men tend to choose as wives women who are beautiful, healthy, and of agreeable disposition, and women tend to choose the more intelligent, more manly, and physically superior men. The ugly, deformed, obviously diseased, and defective are, as they always have been, at a discount in the matrimonial market. This is all to the good, as it makes for the improvement of the race. But along with these tendencies there have arisen, as a result of the peculiar development of our civilization, other tendencies which make the influence of sexual selection of more dubious racial value. A larger and larger proportion of capable and

independent-spirited women are coming to remain single and self-supporting. The race is now losing the inheritance of a not inconsiderable part of its finest types of womanhood. The percentage of women college graduates who marry is commonly but little over 50 per cent. I find that among the woman graduates of the University of California, for instance, from 1870 to 1910, 56 per cent have married. The records of most women's colleges in the eastern part of the United States are not quite so good as this. And it is not the female graduates alone who remain single. The same tendency toward celibacy is found to a somewhat less degree among other women whose intellect and training enable them to secure a comfortable livelihood.

The proportion of men graduates who marry is much higher, being roughly about 90 per cent. Such men, however, marry relatively late in life. The recent studies of Muckermann have shown that the average age at marriage among professors in German universities and technical high schools is over thirty, and that of their wives over twenty-five. The professional classes have always married relatively late in life. The skilled artisan marries younger than the professional man but later than the unskilled laborer. Marriage is usually deferred in proportion as we rise in the social scale. And as age at marriage increases the number of children very rapidly declines.

All studies of the way in which marriage selection

works out in practice show that, contrary to a frequently expressed opinion, like tends to marry like. Pearson has shown that the tall tend to mate with the tall, the short with the short, the intelligent with the intelligent, and even the tuberculous with the tuberculous. As a rule also the dull and stupid find their mates among their own kind. This tendency towards assortative mating tends to break up a population into biological castes. It enables an intellectual aristocracy to maintain itself, and keeps mentally defective strains more or less separate from the normal population. Inevitably there is a good deal of marriage between people who are quite dissimilar both physically and mentally, but it is fortunate that this indiscriminate mating is no greater than it is. From the standpoint of social welfare it is much better for superior qualities to be concentrated so as to give rise to a few highly gifted stocks than to be dissipated in raising slightly the general level of mediocrity. It is also better to keep the inheritance of mental defectives in certain lines instead of allowing it to lower the general average of intelligence by continued intermixture.

Sexual selection, like other evolutionary factors, works in opposite ways at the same time. Through the elimination of the ugly and the vicious and through the choice of the beautiful and the healthy, it tends to promote racial improvement. On the other hand, the celibacy of intelligent and capable women makes for racial deterioration. As a eugenic factor sexual selec-

tion has magnificent possibilities which might be realized if people were sufficiently discriminating in their choice of husbands and wives. Whatever influence this factor has, or can have, is indirectly through its effect upon the birth rate, since the kind of people who mate determines the kind of children who are born.

It is a characteristic of our age that the social function of having babies has come to be very unequally distributed among different classes of the population. The reduction of the birth rate which began in most European countries during the latter half of the nineteenth century is one of the most important biological events that has occurred in the recent evolution of our species. We are not concerned with the purely quantitative aspect of this decline, important as this is in relation to population growth, the expansion of peoples, standards of welfare, and the general course of human history. Our immediate interest is in the effect of the fall of the birth rate upon the quality of human beings who are born.

It is a notorious fact that the birth rate has declined to the greatest extent in what are called the higher social classes. A century ago the present inequalities of reproductive rates apparently did not exist, or at least they were not very pronounced. The limitation of offspring is, however, no new phenomenon of biological history, because it was practiced among the ancient Greeks and Romans to a degree which elicited the comments of contemporary writers. Peoples the world over

have had recourse to various methods of limiting their progeny instead of leaving the matter to the Malthusian checks of war, pestilence, and famine. But aside from the limitation of offspring through late marriages which was accomplished in some of the guilds and certain classes of servants, there seems to have been little voluntary control of the birth supply in Europe until the nineteenth century. Among the higher social classes large families were frequent. According to Whetham, the average number of children in the families of the aristocracy and landed gentry in England during the eighteenth century was 7. By 1880 it had fallen to 4.5, and by 1890 to 3; and there has doubtless been a further reduction since the latter date. In David Heron's study of the changes of the birth rate in London it was shown that in 1851 large families were common in both the upper and lower social classes, with the advantage of net fertility somewhat in favor of the former. In 1901 the higher social classes had much the lower rate of increase. A similar situation is general throughout most highly civilized countries.

Cattell's studies of 261 completed families of American men of science showed that the average number of children per family was 1.88. Allowing for those who do not reach maturity, and for the adults who fail to marry, Cattell estimates that 1,000 American men of science would leave only about 350 grandsons. In Germany Muckermann has found that the average completed family of the professors in universities in

1930 was 2.8, of whom 2.3 lived to maturity. Inasmuch as about 15 per cent in this group failed to marry, the number of children is obviously inadequate to keep the stock from decreasing in numbers. The average number of children per marriage in the families of those engaged in the teaching profession in Germany in 1916 was 2.2, but not all families were completed. In our own country the families of college and university graduates are characterized by the same inadequate size. The Harvard graduates (1881-1890) have an average of 2.06 children per family, and the graduates of Yale an average of 2.04. The families of female college graduates are even smaller.

The small-family system prevails extensively in other classes whose status is more or less comparable to that of college graduates. A few years ago I made a study of family size among the parents who sent sons to the University of California. The average number of children per family was 3.66. Of course, childless marriages were not included, and allowance must also be made for the fact that a given individual, drawn at random from the population, would be more apt to come from a large family than from a small one. Allowing for this bias and for childless marriages, which amount to about 15 per cent in a group of this kind, the average number of children in the families from which California students are derived becomes considerably less than 3, which is not a sufficient number to maintain the stock. The purely statistical bias in favor

of large families may be partly offset by the fact that parents of small families might better afford to send their children to college than parents who have to support many children. In a study of family size among the parents of students in the University of Wisconsin, Baber and Ross found an average of 3.76. It was also found that the families of the uncles and aunts of these students averaged 3.24, not including the families that were childless. In the latter group there was no selective bias in favor of either large families or small ones. There are a few other studies on this subject which lead to the general conclusion that, with the possible exception of some agricultural colleges in the South and the West, the parents of our college students probably represent a group which is failing to reproduce itself at the present time. This rather indefinite class is representative of a large, intelligent, and reasonably thrifty element of our population, which includes much of its leadership, and whose loss would inevitably prove to be a serious misfortune.

A significant fact brought out in the study of family size among the students of the University of California was that the number of children became less as the amount of education acquired by the parents became greater. Where both parents had no formal education beyond the grammar school the average number of their children was 4.17. Where both had a high-school education the average was 3.38, and where both had attended college the average was 3.10. Among the

foreign-born parents the average number of children was 4.60, and among the native-born parents, 3.34. The Catholic families averaged 4.44, the Protestants 3.38, and the Jews 3.73.

The various studies on fertility in relation to occupation indicate that family size decreases as we pass from the learned professions to those pursuits which require little education or skill. In the studies of Stevenson on the fertility of occupational classes in England and Wales based on the census of 1911, the number of children per marriage were estimated as follows:

	Children per Family	*Surviving Children*
Upper and middle group	1.90	1.68
Lower middle stratum	2.41	2.05
Skilled workers	2.79	2.32
Semiskilled workers	2.87	2.37
Unskilled workers	3.37	2.68

Much the same relations are disclosed by studies made in Germany. In 1912 the average number of children per marriage in different classes in Prussia was:

Officials and professional groups	2.0
Technical and business groups	2.5
Skilled workers	2.9
Factory workers and unskilled laborers	4.1
Agricultural laborers, day laborers	5.2

In the birth statistics of the United States we have had data since 1923 on the relative fertility of different

occupational groups, and they tell essentially the same story as those just quoted. Similar evidence is also

NUMBER OF CHILDREN PER FAMILY EVER BORN TO WOMEN WHO GAVE BIRTH TO A CHILD IN THE UNITED STATES REGISTRATION AREA FOR BIRTHS IN 1928, ACCORDING TO THE OCCUPATION OF THE FATHER

Occupation	*No. of Children*	
	Born	*Living*
Agriculture	3.9	3.5
Mining	4.0	3.5
Manufacturing	3.2	2.8
Transportation	2.9	2.7
Trade	2.6	2.4
Public service, including laborers	2.9	2.6
Professional service	2.2	2.1
Personal and domestic service	2.8	2.5
Clerical	2.1	2.0

afforded by data from France and other European countries, and it would be superfluous to adduce further statistics. The important question is, What do these facts mean from the standpoint of eugenics? If the members of all occupational groups were on the same mental and physical level these facts would not have the slightest eugenic bearing. From an *a priori* standpoint one might infer that, since human beings differ greatly in their native capacities, it would be almost inevitable that the occupations which people choose would be in some measure determined by their inherited ability. A moron would not be apt to become

a professor of mathematics or the president of a trust company. He would not be a conspicuous success as a carpenter or an automobile mechanic. He would almost inevitably drift into some unskilled and relatively unremunerative unemployment. The border-line and dull normal cases might qualify for pursuits requiring a slight amount of skill, but they would not do well in technical trades which demand a fairly thorough training. There are certain positions which can be filled only by the better types of minds. A man with gifts of a high order may be engaged in digging ditches or splitting rails, but he is apt sooner or later to leave such jobs for employments which give scope for his superior powers. Lack of education often keeps people down in an economic and social level out of which they would rise if their learning were commensurate with their native capacity. But with all the depressing influence of ignorance and poverty, people tend to work into positions to which they are naturally fitted.

The correlation between occupations and levels of intelligence may be loose, but it is inevitable that there should be some correlation. I suspect that it would vary considerably in different communities. Where a large proportion of the population consists of ignorant peasants, as in Russia, there might be little relationship between occupation and native capacity, because nearly everyone would be engaged in relatively unskilled labor. In an industrial region, on the other hand, where for several generations people had enjoyed the

privilege of free education, so that everyone with sufficient intelligence and enterprise would have the opportunity to rise in the social and economic scale, the population would doubtless tend to become stratified in accordance with levels of ability and effectiveness. In the course of time the lower-grade occupations would become drained of their best types, leaving only those who are incapable of rising higher. Doubtless many things interfere more or less with the operation of this tendency to stratification. A rigid caste system, inherited wealth, and other factors may keep people in positions for which they are unfitted. In a country such as our own, however, the rise of individuals endowed with intelligence and ambition occurs so frequently that there could scarcely fail to be brought about in time a fairly close relationship between occupational status and native ability.

The hypothesis that such a relationship exists does not rest upon *a priori* considerations alone. It is supported by practically all the available evidence that bears upon the problem. This evidence, it is true, is largely indirect. It may be rejected, as it sometimes is, by the more extreme type of environmentalist. But unless one goes so far as to contend that our measures of intelligence are not worth anything at all, he can scarcely fail to admit that people tend to decrease in intelligence as we pass from the higher occupations to the more unskilled pursuits. A part of this gradation is doubtless the result of environmental influences, but it

cannot be altogether due to the accidents of fortune that engineers rank higher in the intellectual hierarchy than teamsters or barbers. This for the simple reason that a moron cannot become an engineer.

When psychologists have considerably improved their technique of mental measurement, it would be very advantageous to have mental tests of a large random sample of people following various occupations. There are difficulties, however, in carrying out this delicate undertaking on a sufficiently large scale, because most adult human beings would probably object to undergoing the ordeal. The nearest approach to an adequate collection of such data is furnished by the celebrated and much derided army mental tests. At the time of the draft an exceptional opportunity was afforded for obtaining intelligence tests of a very large sample of the adult American population. These tests were often carelessly administered, and the results cannot be considered as giving more than a crude relative rating of the individuals tested, but they proved very useful for the purposes for which they were given. The general outcome, so far as the relation of intelligence to occupation is concerned, is about what might have been anticipated. Men following occupations involving skill and special training tested high. The unskilled laborers stood at the lowest end of the scale, and carpenters, salesmen, cooks, waiters, etc., occupied various intermediate levels according to the intellectual requirements of their trades.

That the members of different occupational groups are on somewhat different levels of intelligence is indicated also by the callings followed by the fathers of distinguished men. If we inquire from what classes men of intellectual distinction are commonly derived we find that a high percentage of them come from the learned professions. To a somewhat less extent they are derived from successful business men. The skilled artisans furnish a somewhat smaller quota, and it is only rarely that a genius springs from the ranks of casual labor. DeCandolle's studies on the origin of the members of the Paris Academy of Sciences, Odin's investigations on the parentage of 623 noteworthy Frenchmen, Galton's studies on English men of science, and Havelock Ellis's work on British men of genius have all supplied confirmatory evidence of this general conclusion. Further evidence of the same kind is afforded by Vischer's studies of the parentage of people whose names are included in *Who's Who in America*. Most Americans of intellectual distinction are in this compilation of celebrities, but various other people are included who are more or less in the public eye, although they have very modest claims to intellectual superiority. Nevertheless the list suffices to give a fairly good idea of the contributions of different occupational groups to the intellectual leadership of the country. At the head of the list stand the Unitarian clergymen, with one son out of seven included in *Who's Who*. At the other end of the list are the unskilled

laborers, who have contributed to this collection only one out of forty-eight thousand. The quotas of other groups are indicated in the table.

NUMBER OF MEN IN OCCUPATIONAL GROUPS PER SON OR DAUGHTER IN *Who's Who in America*, 1922-23. DATA FROM HUNTINGTON AND WHITNEY

Unitarian clergymen	7
Clergymen of all denominations	20
Baptist clergymen	43
Lawyers	52
Business men	80
Methodist clergymen	97
Physicians	104
Engineers (chiefly non-technical)	160
Farmers	690
Skilled laborers	1,600
Unskilled laborers	48,000

If we start not with men of distinction, but with children whose intellectual status is gauged either by their scholastic records or by mental tests, and then ascertain the occupations followed by their fathers, we find a similar relationship. This is shown in Terman's studies on the parents of 1,000 gifted children in California, as we have stated in the previous chapter. In their tests of 13,419 children of eleven to twelve years of age in the schools of Northumberland, Duff and Thomson found that there was a reduction of the I.Q. in the various classes as one passes from the children of the professional group to those of common laborers. The average test scores were as follows:

Professional classes	112.2
Industrial overseers	110.0
Wholesale dealers	109.3
Soldiers, police, post-office employees	105.9
Retailers	105.0
Technicians	102.9
Farmers and farm laborers	97.6
Unskilled laborers	96.0

Several other investigations in this field have yielded essentially similar results.

If instead of investigating the ancestry of intelligent children we start with a group on a low mental level, and inquire into the occupations of the parents, we obtain some very significant results. Prokein has studied the parentage of 364 mentally defective students in the special schools of Munich and found that, in proportion to their numbers, the unskilled laborers contributed about three times as many defectives as the skilled workmen. Defective children are relatively rare in the families of the upper occupational groups. They come predominantly from the classes of individuals whose pursuits do not demand more than a modest degree of intelligence.

That the masses who are condemned to toil in the poorly paid drudgery of our economic life are in any way inferior is a conclusion which many are loath to admit. To brand the unskilled laborer as a person whose intelligence is not quite up to the general level seems like adding insult to injury, and a natural sympathy for the under dog arouses a sort of recoil against

this conclusion. I have it myself. On the other hand, many of us like to console ourselves with the reflection that those who have won success are not so wonderful after all. One must be an undiscerning reader not to perceive the influence of these emotional reactions in many of the discussions of this topic. Whether we like it or not, the actual evidence supports the conclusion that birth rates tend to be high as levels of intelligence are low. The very lowest types of idiots and imbeciles form an exception to this rule, but this class is so small that for practical purposes it may be left out of consideration. It is the class of feeble-minded and borderline cases immediately above the imbeciles that creates so many of our serious social problems. I shall not recount the familiar histories of such degenerate stocks as the Jukes, Kallikaks, Zeros, Pineys, Nams, and the Tribe of Ishmael. They all show much the same records for pauperism, vagrancy, prostitution, and petty crime. Despite a very high infant mortality and the sterilizing effects of prostitution, the natural increase of these stocks goes gayly on.

A typical illustration of the unrestrained propagation of feeble-minded women is afforded by the case of a feeble-minded pauper from Indiana by the name of Polly. According to Dr. A. W. Butler, Polly is known to have had eleven illegitimate children, each with a different father. "One of Polly's daughters, feeble-minded like her mother, has had eight illegitimate children, seven of whom are of the same mental caliber.

One of these has had four illegitimate children. In this group there have been twenty-three illegitimate children, the offspring of three feeble-minded women. Altogether Polly has 56 lineal descendants, 31 of whom are feeble-minded, and eighteen of whom have been inmates of public institutions. Sixteen of the eighteen are known to have spent a total of 72 years on public support at a cost of $10,800. This is one branch of a family group of 477 individuals representing seven generations. The younger members are still a serious problem in the life of the community."

There are many Pollys who afflict society with their defective progeny. Whetham remarks: "Feeble-minded women, whether married or unmarried, are remarkably fertile. The workhouse records frequently note that five, six, or seven children have been born before the mother is twenty-five years of age. . . . Most of these children inherit the mental condition of their parents, and where both parents are known to be feeble-minded, there is no record of their having given birth to a normal child. In one workhouse there were sixteen feeble-minded women who had produced between them one hundred and sixteen children with a large proportion of mental defect. Out of one such family of fourteen, only four could be trained to do remunerative work."

With regard to the fertility of feeble-minded stocks, it has been pointed out that the feeble-minded children from the degenerate families who used the special

schools in London come, sometimes two or more at a time, from households averaging about seven offspring, whereas the average number of children who now use the public elementary schools is about four. According to a report of the Eugenics Survey of Vermont, the average number of children per inadequate family (i.e., having one or both parents feeble-minded or insane) was 3.5, or including stillbirths and children dying in infancy, 4.3. "In the cases of the parents not known to be insane or feeble-minded, excluding the children who died in infancy, stillbirths and sex unknown, the average is 3.04, including the above 3.34." Of the 152 families investigated, including 5 which were childless, it is significant that those in which one or both parents were defective were of considerably larger size.

In Green's studies of birth and death rates of the feeble-minded it was shown that the average number of children of 211 feeble-minded women was $6.43 \pm .17$. Taking the 154 families in which the number of children born and the number surviving to sixteen years of age were known, it was found that the mean number of survivors was $4.51 \pm .14$, the mean number born being $5.84 \pm .19$. There was no significant decrease in the fertility of feeble-minded mothers since 1840; hence this element of the population seems to have been little affected by the general decline of the birth rate.

Popenoe found that the families of the feeble-

minded in California were of smaller size. This may be due in part to a different method of selection, and in part to the fact that California is a state with an uncommonly low birth rate. The data were obtained from the Sonoma State Home for the Feeble-minded. "The married, feeble-minded females," says Popenoe, "who had any living children at all at the time of sterilization, had an average of 2.12 each. The curve shows that their completed family would probably have consisted of three—certainly not more than four." The most defective of the women were found to have the largest families. The mothers of the inmates had an average of 4.09 living children, or, if the number is reduced for the effects of selection, 2.56, although not all the families were completed. So far as the imperfect data justified the formation of a conclusion it was inferred that in California "the feeble-minded family is large enough to reproduce itself or a little more." At any rate Popenoe considers that "the fecundity of the feeble-minded is more than half again as great as that of the stock which sends its sons and daughters to Berkeley."

Unfortunately we do not possess statistical data on the fertility of very large samples of our feeble-minded population. To a large extent the feeble-minded are derived from the dull normal and border-line groups a little above them in the intellectual scale. This group is characterized by a relatively high fertility. From what is known of the probable way in

which mental ability is transmitted one would anticipate that the more extreme types, both high and low, would be derived from parents who are somewhat less extreme. This is to be expected of any trait whose degree of development depends upon several different kinds of genetic factors. Great men commonly come from unusually intelligent parents, and morons commonly come from rather dull parents. One may, of course, pick out exceptional cases, and these one would expect now and then according to the principles of Mendelian segregation.

If we base our judgment on what is known of the relation between fertility and levels of intelligence, we are forced to conclude that the more intelligent are being outbred by those on a lower mental level. Such is the eugenic predicament in which our race finds itself. Although this situation is recognized by most competent and critical students of population trends, a number of writers have exercised their ingenuity to discover reasons for not accepting this unpleasant conclusion. Others who admit that the present differential birth rate is dysgenic contend that it is nothing to be disturbed about. Most of the efforts to justify an attitude of placid indifference in this regard impress me as based more on wishful thinking than on a critical and impartial weighing of the evidence. No one can deny the fact of differential fertility. And unless we assert that heredity has nothing to do with intellectual achievement we must admit that there are some

grounds for the doleful forebodings of the eugenists. It is quite evident that we are losing the stocks represented by our college-bred population. There is good evidence also that we are losing the stocks that have achieved success in most kinds of intellectual pursuits. We are prone to regard as an ideal a state of society in which everyone with sufficient native ability is able to rise in the social and economic scale. The usual consequence of such success, however, is sterility. Whatever may be said for the advantages of free opportunity, it should be borne in mind that the more extensively it is realized the more rapidly, under present conditions, is the population drained of its best hereditary stocks. This is one of the great tragedies of our time. The evil is all the more dangerous because it is insidious. In recent decades it has probably become greater in extent as education has become more widely diffused.

CHAPTER V

Natural Selection, or the Ministrations of Death

IF the wrong kinds of people could all be killed off early in life it would be a great aid to the progressive development of the race. Nature brings all sorts of human beings into the world and she gets rid of her more ill-favored offspring rather more rapidly than her less imperfect ones. But this selective function is performed in the loose, blundering, and wasteful manner that characterizes so much of Nature's dealings with living creatures. Multitudes of her finest products are sacrificed with a prodigal hand; it is only on the average and in the long run that they prove more successful in escaping destruction.

The extent to which death is a respecter of persons varies greatly according to circumstance. As a result of their peculiar complex of hereditary factors, some individuals are much more prone to die than others. In fact, there are some kinds of heredity which are tantamount to a death sentence from the start. A child with the proper genes for amaurotic family idiocy usually lives less than two years. As we have previously stated, a person inheriting the dominant factor for Hunting-

ton's chorea has his sentence deferred until a later period of life, but unless he dies from some other cause in the meantime his fatal heredity will finally overtake him.

The theory of natural selection involves three fairly obvious elements: (1) the occurrence of hereditary variations, (2) the struggle for existence, and (3) the survival of the fittest. In most discussions of the subject, and especially those of Mr. Darwin, the chief emphasis is laid upon the selective influence of mortality. In a broad sense of the term natural selection includes the effect of differential fertility as well, since a variety may survive by virtue of a high rate of reproduction as well as by virtue of superior adaptiveness to its conditions of life. Fertility is just one of several characteristics of a stock which insures its survival. Selection based on fertility has been distinguished by Professor Karl Pearson as reproductive selection, as contrasted with the survival of the fittest individual, or natural selection in a somewhat narrower sense. It is in this restricted sense that the term natural selection is used in the present discussion.

The statement is sometimes made by writers on human evolution that natural selection has been practically done away with through our advances in medicine and hygiene, which enable us to preserve most of the weak who would have perished in a primitive state of society. In so far as the weak are rescued from extinction, to that extent the action of natural selection

may be said to be reduced. We have been doing everything we can to save these weaker brethren and have undoubtedly achieved a creditable measure of success. Nevertheless, the naturally frail are more prone to die than the strong, and doubtless they always will be, despite all that can be done to save them. We may piously regard this as a beneficent dispensation of Providence, while at the same time we consider it our bounden duty to do everything in our power to circumvent it.

There have been several statistical investigations undertaken with the aim of showing that natural selection is in actual operation in our midst, but the most obvious and incontrovertible evidence of its potency is the occurrence of deaths resulting from particular kinds of hereditary defects. We may confidently assert, for instance, that natural selection tends to eliminate strains with an inherited factor for Huntington's chorea. Haemophilia, which is transmitted as a recessive, sex-linked character, and is hence usually found only in males, often leads to death on account of the difficulty of stopping haemorrhage. In the Mampel family, out of thirty-seven reported deaths, seventeen were due to this cause. We can say therefore that natural selection tends to eliminate strains affected with haemophilia. A similar statement may be made concerning a large number of pathological conditions and diatheses to disease. There are hereditary diatheses to diabetes, asthma, heart disease, very probably tuber-

culosis and, to a certain extent, cancer. One might make an extensive list of hereditary causes of death. Among some of the most potent are those which affect nervous and mental development. Epilepsy frequently leads to an early death, and in other cases prevents marriage and the procreation of children. Individuals with insanity of a hereditary type, such as dementia praecox and manic-depressive insanity, have a death rate very much greater than that of the general population in the same age groups. Besides, their reproduction is often checked through their failure to marry or by confinement in an asylum.

Among the low grades of mental defectives the greater number of deaths occur before the period of adolescence. Barr states that out of 625 cases of mental defect of whose deaths he had records, "the largest number of deaths occurred between ten and twenty years; but comparatively few passed the twenty-fifth year and exceptional cases appeared from thirty to forty years." Clark and Stowell find that in the New York City hospitals and schools the mortality among the feeble-minded is double that of ordinary children, and that the mortality of the lowest grades of idiots and imbeciles is four times as great as among the feeble-minded. The high infant mortality among mentally defective stocks such as the Jukes and Kallikaks is a matter of uniform comment in the annals of these now celebrated families.

High infant mortality, as one might naturally expect, is strongly correlated with ignorance, poverty, and low intelligence. Here we have a vicious circle of influences, so commonly met with in social phenomena. We may

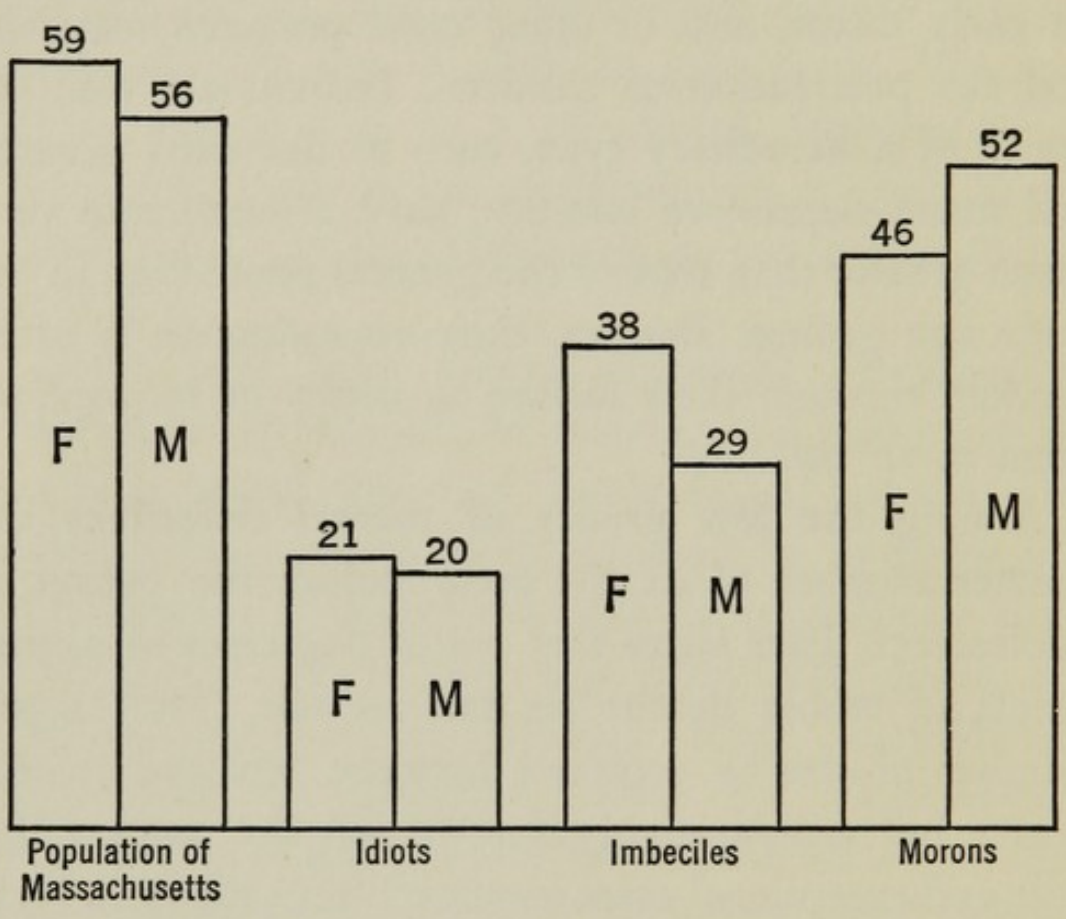

FIGURE 3. Expectation of life at two years of age in mental defectives and the general population of Massachusetts. *M*, males; *F*, females. (Data from Dayton.)

follow a common practice and contend that poverty is the cause of high infant mortality, and that it is, directly or indirectly, responsible also for ignorance. It is doubtless true that in the lower economic groups many infants of excellent parentage die on account of their unfavorable environment. On the other hand,

people of inferior mentality tend in the long run to sink into a condition of ignorance and squalor and their offspring consequently suffer. The very high mortality among idiots and low-grade imbeciles is doubtless due largely to the fact that their mental condition is an index of some grave constitutional defect or disorder, but when we pass from these more or less pathological types to the higher grades of normal stupidity, there is little evidence of constitutional weakness of organization. A high-grade moron may be a very good physical specimen of humanity. The high mortality, especially in infancy, which is so common in this type, is partly a direct result of lack of intelligence, and partly a consequence of the low economic level into which such people so frequently gravitate.

A study of the mortality rates in different occupational groups shows that, in general, death rates are highest in those employments which make little demand upon the intellect. This statement has to be qualified on account of the high mortality in certain dangerous trades, and by the fact that the death rate is commonly low among unskilled workers in rural communities. One of the most valuable studies of occupational mortality has been made by Dr. T. H. C. Stevenson on the basis of the census returns of England and Wales. The population was divided into groups according to the degree of skill and training possessed by their members, and it may be seen from the table (Table 1) that the mortality rates in the several age

groups increase as one passes from the first class to that of unskilled laborers. The English data are of more value than those from the United States, because the different classes are more stable, but there are everywhere sources of error in drawing conclusions from statistics of this kind. An individual who becomes ill, say from tuberculosis, may for this reason change his occupation, and hence help to increase the death rate in some other employment. Changes in occupation thus brought about would probably be mainly between employments requiring much the same degree of skill, and hence would not greatly affect our conclusions on the relation between intelligence and mortality.

TABLE I

MORTALITY OF OCCUPIED AND RETIRED MALES, 15 TO 65, IN ENGLAND AND WALES ACCORDING TO SOCIAL CLASS, 1921-23

	Ages						
Class	*15-19*	*20-24*	*25-34*	*35-44*	*45-54*	*55-64*	*Infant Mortality*
I	142	237	261	484	985	2,247	38
II	205	307	376	589	1,090	2,469	55
III	243	347	380	590	1,070	2,508	77
IV	248	367	420	669	1,173	2,482	89
V	299	408	498	880	1,507	3,061	97

(Death rates are per 100,000 in each age group except those for infant mortality, which are per 1,000 births. Class I includes the upper and professional groups, Class III the skilled artisans, Class II those intermediate between I and III; Class IV includes semiskilled laborers, and Class V the unskilled laborers.)

To a certain degree, occupations select different kinds of human beings and then subject them to conditions whose wholesomeness varies in different callings. But, as Dr. Stevenson has remarked, "the effect of occupation upon male mortality is probably on the whole more indirect than direct," and "mortality is influenced more by the conditions of life implied by various occupations than by the direct occupational risks entailed." Among these conditions, remuneration, with all that this implies in relation to human welfare, must certainly be given a prominent place.

As a rule, the groups with the greatest expectation of long life are those having also a low infant mortality. In the table it may be seen that the infant death rate increases in the descending order of the occupational classes, being considerably over twice as high for the fifth class as for the first. The very low infant death rate of 39 per 1,000 for the graduates of Mt. Holyoke College shows that, although these mothers are not strong on fertility, they are remarkably successful in saving what children they have. A striking contrast is presented in the infant mortality rate of 286 among the domestic servant class in Prussia (1912-1914).

That a close relation exists between infant mortality and the income of the father is established by an abundance of data. Duncan and Duke in their survey of infant mortality in Manchester, New Hampshire, found that when the earnings of the father were less than

$450 the infant death rate was 242.9 per 1,000 born. With incomes between $650 and $890, the infant death rate was 162.6, while fathers earning $1,250 or over lost only 58.3 per 1,000. The difference between the infant mortality rate of Chicopee, Massachusetts (177) and that of Brookline (55) doubtless reflects the different economic and cultural status of the inhabitants of these towns. How far poverty should be considered a cause of high infant mortality is not easy to determine. Many who are poor as the result of misfortune nevertheless take very good care of their children, but those who are poor because they are mentally incompetent are apt to prove rather dangerous guardians of their offspring.

I have elsewhere[1] defended the view that the action of natural selection has in some respects been increased instead of diminished by our advances in civilization. In our complex social and economic order people are subjected to a diversity of living conditions which is far greater than that which prevails in primitive society. In a tribe of savages most of the men follow much the same pursuits and live in much the same way. The care of infants is about equally bad among all classes of mothers. A man on the dull normal level who could take his part in the customary activities of the group would probably fare about as well as anyone else. In a complex industrial society, on the other hand, a pre-

[1] *Studies in Evolution and Eugenics*, Chap. 8.

mium is placed on intelligence, and this has tended to segregate people more or less in accordance with their mental levels. Although the segregation may have been very imperfectly accomplished, the difference in status between the well and the poorly endowed is doubtless greater than in a less developed economic régime.

What is especially significant about occupational death rates is that the differences are greater in the early and the middle age groups and tend to become equalized in old age. It is only the mortality that occurs before or during the reproductive period that has any direct effect upon the course of biological evolution. After individuals can no longer produce offspring it matters little what becomes of them. As is shown in Table I, the mortality in Class V is over twice as great as in Class I in ages 15 to 19, nearly twice as great in ages 25 to 35, about 53 per cent greater in ages 45 to 54, and only 36.2 per cent greater in ages 55 to 64. The mortality rates from respiratory diseases show class differences which are still greater in the earlier ages, the rate for pulmonary tuberculosis, for instance, in ages 20 to 24 being 158 in Class V and 50 in Class I. When we pass to the period of infancy we find that mortality rates in the occupational groups differ more widely than in the adults, as may be seen by an inspection of the table. Although there was an enormous reduction in infant mortality in England and Wales between 1911 and 1921, the infant death rate remained over twice as high in Class V as in Class I in both

census years. This means, of course, that the effect of selective mortality is to eliminate the kind of stocks represented in Class V more rapidly than those in Class I.

At present natural selection is, I believe, working with a considerable degree of discrimination in the elimination of individuals of subaverage intellect. Unfortunately natural selection and reproductive selection work at cross purposes. Were the providential ministrations of the selective death rate not counteracted by the more potent influence of differential fertility the race would be once more on the highway of intellectual progress.

We know less about the relation of occupation to mortality and fertility in women than in men. Teachers and women engaged in pursuits requiring education and technical training are regarded as quite good actuarial risks. Women in the lower occupational groups naturally have a higher death rate, although they more than make up for it by their greater fertility. One minor selective factor which may be worthy of mention is the selective influence of prostitution. Although it is not specified in the list of occupations enumerated by the United States Census, prostitution is really an extensive and fairly well organized business. Estimates of the number of women following this calling in various cities show such an amazing degree of discrepancy that little reliance can be placed on any of them. The turnover is rapid. The statement is not infrequently made

that prostitutes live on the average for only about five years after they embark on their downward course, but this is now known to be sheer pious invention. The death rate even in the certified group, while higher than in the general population, is not excessive. As a rule, a prostitute soon becomes infected with venereal disease; she has a weakness for liquor, and she is usually imprudent in the care of her health. According to Flexner, prostitutes commonly follow their calling for only a few years, after which they go into domestic service and various other employments.

It is among their children rather than among prostitutes themselves that death takes its heavy toll. In the first place, the birth rate in this class is checked both by voluntary control and by venereal disease. Of the children who are born many die early from congenital syphilis or other consequences of their unfavorable environment. Were it not for the peculiar conditions incidental upon their occupation, women of this class would probably be among the most prolific of their sex. As it is, they probably do not constitute a self-perpetuating group. Hence if women of this class are characterized by the possession of hereditary qualities different from those of their more respectable sisters, their relative sterility cannot fail to affect our racial inheritance. What kind of heredity is thus being lost? As to intelligence, the upshot of several studies indicates that the I.Q. of the prostitute class is low. I am inclined to discount somewhat a number of these find-

ings, although there is good evidence that the profession, as a whole, is characterized by intelligence lower than the average. To a large extent it is recruited from the daughters of the lower occupational groups. It is the natural recourse of the mentally defective girl who is left to her own devices. The general consensus of opinion among students of mental defect is that the female moron is cut out to be a sexual offender. According to the report of the Massachusetts Committee to Investigate the White Slave Traffic, So-called, "of 300 prostitutes, 154, or 51 per cent, were feeble-minded, and . . . the mental defect of these 154 women was so pronounced and evident as to warrant the legal commitment of each one as a feeble-minded person or as a defective delinquent. . . . The 135 women designated as normal were of distinctly inferior intelligence." Bonhöffer reports that out of three hundred prostitutes in prison at Breslau two-thirds were mentally defective or abnormal, and similar findings have been made by other observers. The female offenders who become subjects of investigation probably represent the lower mental levels of their class, but granting this fact, the race is doubtless the gainer from the sterilizing effects of this calling.

Drs. Reid and Haycraft have contended that alcohol is a racial blessing in disguise because it eliminates a number of weak-willed and nervously unstable people who drink themselves into an early grave, but prostitution as a means of eugenic improvement still awaits

its apologists. That this Moloch which requires the sacrifice of so many of the daughters of men should prove to be in any sense a benefactor to the race may come as something of a shock to the gentle reader. But even if prostitution eliminates some undesirable kinds of germ plasm, one must reckon with its many secondary effects, and especially those resulting from the dissemination of venereal diseases. Here we encounter a problem of unusual difficulty. If we inquire what kind of heredity is most frequently cut off as a consequence of these diseases we must frankly confess that we do not know. We might be prone to infer that they are visited most frequently upon the more depraved and degenerate of human kind, but I am not at all sure that we are justified in deriving any consolation from this thought. There is no doubt that venereal diseases are much more prevalent among Negroes than among the whites, and it is stated that syphilis in women is less common in the higher than in the lower social classes. Dr. Fritz Lenz, who has discussed the subject at considerable length in his valuable book *Human Heredity and Racial Hygiene*, concludes that venereal diseases produce several kinds of effects, both eugenic and dysgenic. In his opinion they tend to sterilize those who are weak in will and careless of consequences, while the more prudent are spared. They also tend to be more common among the more lusty and vigorous males who are tempted to indulge in irregular relations with the other sex. Then they are supposed to be more

apt to be contracted by the more ardent and emotional females, and for this reason it is conjectured that they have aided in developing a certain degree of frigidity among modern womankind. All these conclusions are based chiefly upon purely *a priori* considerations and, however plausible they may appear to be, they are lacking in inductive verification.

The racial effects of prostitution are paralleled to a certain extent by those caused by crime, vagrancy, and chronic inebriety, which are more especially the prerogatives of the male sex. The net fertility of criminals, or at least those who are caught, is probably not high, although there is little reliable information as to the number of illegitimate children for which such men are responsible. The study of Bonhöffer on four hundred beggars and vagabonds of Breslau showed that most of those who were married had but one or two children. There is more or less human wreckage which is relatively unprolific, and it goes without saying that, from the racial standpoint, this is all to the good.

Unfortunately our data are insufficient to enable us to ascertain how greatly the race is the gainer through the loss of these human failures. Death is continually removing the weak, the stupid, and the abnormal, but its friendly ministrations are more than counterbalanced by the dysgenic effects of the differential birth rate. Despite their low mortality, the intellectual classes of most countries do not represent a self-perpetuating group. And, despite their higher mortality, the stocks

on the lower intellectual levels show the greatest preponderance of births over deaths. Under existing conditions it is the border-line or dull normal type which seems to be the best adapted for survival in the struggle for numerical supremacy.

CHAPTER VI

Eugenics and Its Critics

ON its practical side the aim of eugenics may be very simply stated: It is to have people born with good heredity instead of bad. With this general aim it might be thought that all intelligent people would be in sympathy, however greatly they might differ as to the means by which it should be brought about. But in matters touching human relationships opinion is swayed by so many kinds of bias that one must be prepared to encounter opposition to almost any conclusion, however reasonable. As to the breeding of plants and animals our attitudes are much more objective. If there was ever a farmer who thought that it did not matter whether he bred from his runts and scrubs or from his finest animals his name is not recorded in the annals of genetics. When it comes to the runts and scrubs of humanity, however, the case is different. It is of course possible to contend that there is no such thing as bad heredity, like the Kentucky colonel who declared there is no such thing as bad whisky. There may be no bad heredity in a pure line of garden beans, but as human beings are not self-fertilizing organisms like the beans, they cannot escape

a certain amount of hereditary imperfection. To be sure one sometimes hears the remark, "I don't believe in heredity," as David Lloyd George is said to have once declared in a political speech. What people apparently mean by this absurd statement is that hereditary differences among men are comparatively unimportant. In these days, however, when so much has been learned about the inheritance of human characteristics, both normal and pathological, the failure to recognize the importance of hereditary differences means simply ignorance of plain facts.

As eugenics has a practical as well as a theoretical basis, it is open to attack on either score. In its purely scientific aspect eugenics is concerned with the changes occurring in the hereditary traits of human beings. A eugenist may limit himself to a study of these changes and their causes without troubling himself in the least with the practical problem of race improvement. If he is convinced that the race is speedily going to the dogs he may be quite content to see it go on. The practical eugenist, on the other hand, cannot ignore the purely scientific aspects of the subject, since he must base any proposed measures for race betterment upon the results of eugenic research. If these results reveal a condition which is on the whole satisfactory, he would have little occasion for meddling.

Much of the opposition to eugenics doubtless springs from an aversion to any interference with the liberties of human beings in the matter of reproduction. The

eugenist is often represented as an officious person who would dictate who should marry whom, and who should and who should not have children in order to produce a race of supermen who would have all the qualities the eugenist thought desirable. To Mr. Chesterton, for example, eugenics means marriage by the police; and Mr. Clarence Darrow, who agrees with Mr. Chesterton in few other things except the futility of prohibition, accords to eugenics the distinction of being, among all the schemes for remodeling society, "the most senseless and impudent that has ever been put forward by irresponsible fanatics to plague a long suffering race."

Individual reactions to eugenics vary all the way from boundless enthusiasm to the most bitter and violent antipathy. The subject has never enjoyed a high degree of popular favor. Being founded on the natural inequality of man, eugenics is often regarded with distrust by those who would attribute the imperfections of mankind to political injustice or the iniquities of the capitalistic system of society. To ascribe human inferiority to heredity instead of to causes for which somebody can be blamed is regarded as a dangerous concession. There is really no compelling reason why a socialist, communist, anarchist, or Bolshevik may not be a eugenist—in fact there are eugenists in all these groups; nevertheless opinions on eugenics among all these theorists are apt to be colored by their particular brands of economic or social philosophy.

Among students of the social sciences we find a variety of attitudes. It is not surprising that those who concern themselves with the working of social and economic forces should often be prone to minimize the importance of biological factors in human affairs. On the other hand, the biologists may be accused of a similar bias in favor of their own science. We have the hereditarians and the environmentalists, both moderate and extreme. The proneness to stress the importance of one's own field is due partly to habits of thought, but in a greater measure, I suspect, to a certain egoistic satisfaction that arises from the conviction that the particular subject with which one is identified has an importance that cannot be disregarded. Even among highly trained scientific men the subtle and seductive influence of *amour propre* is by no means an unimportant factor in the formation of opinion.

For a similar reason people engaged in social reform and the amelioration of the lot of their fellows are often averse to admitting that a good deal of human wretchedness is the product of bad heredity. Such a view is regarded as fatalistic and discouraging to their humanitarian efforts. It would be much more comforting to believe that our social evils are all due to remedial causes, since there would then be more justification for our labors to improve the conditions of the unfortunate.[1]

[1] Since writing this I have come across so beautiful an illustration of the attitude described that I cannot help quoting it. It occurs in a

Then there is the racial bias. One finds it especially prevalent among intellectuals of Jewish extraction. No one can accuse the Jews as a stock of being deficient in native endowment of brains. Few people can boast of as fine a record for intellectual achievement either in the past or in the present. But notwithstanding their own claims to racial superiority, the Jews evince a decided leaning toward egalitarianism. There are, it is true, a number of prominent eugenists of Jewish origin. As a rule, however, the Jews are hostile to any kind of racial discrimination, and they are often antagonistic to eugenics for the same reason. Doubtless one cause of this attitude is the fact that the Jews have long been victims of oppression and ostracism on account of their race. In many places they are still discriminated against socially and not infrequently on other grounds also. Racial distinctiveness is a subject upon which they have developed a sensitiveness which in some cases becomes a morbid complex. Feeling that they are somehow on the defensive, they are not easily tolerant of other people's pretensions to superiority. Jewish anthropologists —and anthropology has come to be largely a Jewish

volume on the *Scientific Basis of Social Work* by M. A. Karpf, director of the Training School for Jewish Social Work, New York City, and runs as follows:

"The notion of biological heredity and of innate capacity, as a determining factor, would have a paralyzing effect upon the young social worker, faced as he is with problems of maladjustments of various kinds. Without the hope and courage which the theories of social causation and social control give, no one could long endure social work. . . . Nevertheless, it is important that the social worker be aware of the theories of biology, if only because of the challenge they provide."

science—love to pitch into the "Nordic myth," and a number of them seem to find much satisfaction in the doctrine that the mental endowments of the African Negroes are on the same level as those of the whites, even the much-extolled Nordics. If this doctrine could only be clearly established!

Another factor which, in these days, influences opinion on eugenics is the anti-reform complex. To be in any sense an "uplifter" is to become an object of scorn, and since the practical eugenist cannot exonerate himself from the charge of belonging to this obnoxious group, he must bear all the opprobrium that attaches thereto. This attitude is well exemplified in the *American Mercury*, in which the eugenists come in for their share of jibes along with the other pestiferous reformers against whom this periodical has been waging a holy war.

I cannot help thinking that another source of opposition to eugenics lies in the effort to find some justification for reducing the birth supply below the reproductive level. People of intelligence and education who have unduly restricted their families are loath to admit that such a procedure is conducive to racial decadence. That there is any moral obligation to perpetuate good heredity, and especially that it is incumbent upon anyone to sacrifice a few of the comforts of life in the interest of future generations, is a conclusion which many are indisposed to admit if they can possibly get out of doing so. The obvious defense reaction, under

the circumstances, is to find reasons for believing that the alarms of the eugenist over the differential birth rate are quite unnecessary. As the eugenist preaches a disquieting doctrine, it is desirable for one's peace of mind that he be refuted, or at any rate that he should not be taken too seriously.

One is of course not warranted in attributing all criticism of eugenics to mere prejudice, but the perusal of considerable controversial literature and conversations with my friends and colleagues have convinced me that the opposition to eugenics cannot be adequately understood without considering the various phobias, complexes, and kinds of bias which constitute the emotional basis of people's opinions on this subject. Still another factor, as candor compels me to admit, is contributed by the unfortunate utterances of the eugenists themselves. In reading the productions of my fellow eugenists I not infrequently meet with statements that cause me to squirm. It must be confessed that much of the literature on eugenics, in the present infancy of this science, is characterized by hasty generalization and uncritical overstatement. This kind of advocacy naturally arouses the opposition of cautious and critical minds and affords tempting opportunities for the critics. In so far as criticism is not based on misrepresentation, as unfortunately so much of it is, it affords a wholesome influence. If, therefore, the incautious eugenist comes in for a drubbing occasionally, it will only be helpful to the cause in the long run.

One of these drubbings which has doubtless given considerable entertainment to its readers has been administered by the well-known criminal lawyer, Mr. Clarence Darrow. Having chosen a title, "The Eugenics Cult," which is calculated to prejudice the jury from the start, Mr. Darrow proceeds to describe the activities of the proponents of eugenics in such lurid phrases as "much beating of drums, blowing of trumpets, cries in the night of race suicide" and other expressions that are much more descriptive of the author's state of mind than of the real state of the case. In the course of his article Mr. Darrow scores a few points against some of his opponents whose ardor had betrayed them into making some indefensible statements. With this phase of the controversy we are not here concerned. But Mr. Darrow is not content with criticizing certain schemes for eugenic reform. He is against the whole meddlesome enterprise on principle.

It is not denied that human beings differ, even profoundly, in their hereditary traits, both physical and mental. Mr. Darrow is willing to admit, at least for the sake of the argument, "that man can be changed by controlled breeding," and that within limits "we might breed men who were lean or fat, or tall or short." "But on what grounds," he asks, "would anyone be rash enough to want to change the physical type of man?" How Mr. Darrow became persuaded that eugenists aim to change the type of human organization I cannot imagine. All of them, so far as I am aware, are quite

content with having five fingers on their hands instead of six, and with the present number of our ribs. What they are aiming at is not to change the physical type of man, but to get rid of such departures from that type as split hands, fragile bones, atrophy of the optic nerves, and other pathological conditions which are clearly passed on by inheritance. Mr. Darrow had abundant opportunity to know this and he should have been candid enough to admit it, but this is not his way. Being bent upon making the case of his opponents seem as ridiculous as possible, he makes liberal use of the controversial device of setting up a man of straw in order to demolish it with a great show of effectiveness. Hence we find him making the ridiculous accusation that the eugenists are "ambitious to meddle with the perfection of the Cosmic Plan itself," and that they have "forgotten that man, as he stands, is created in the image of God"! Such presumption is shocking even to the piety of Mr. Darrow!

"But perhaps they [the eugenists] do not desire to breed a different physical being," Mr. Darrow continues in his attorneyesque way. "Perhaps, with Dr. McDougall, they will say that their real aim is to breed for better intellects." If so, we are warned that "The workings of heredity are obscure enough in the body; they are hopelessly indefinite in the mind. No eugenist knows anything about breeding for intellect. . . . We do not know what intelligence is, much less how to breed it." Hence the natural inference is that in our

ignorance of the laws of mental heredity, nothing could be accomplished toward changing the mental endowments of people through selective breeding. If a genius were as likely to appear among the progeny of the feeble-minded mothers in an English workhouse as he is to arise in a highly gifted family one might agree with Mr. Darrow. However influential a favorable environment may be in promoting the development of the mind, we are quite certain that it is incapable of overcoming the handicaps bequeathed by feeble-minded parents. Even though we may not know what intelligence is, at least to the extent of being able to define it to the satisfaction of every captious critic, we at least know that some people are more intelligent than others, and this being so, the statement that "no scientist has ever pretended to advance any theories for breeding intellect" is irrelevant. There is no more inherent difficulty about breeding for intellect than about breeding for large size. The older breeders of plants and animals achieved striking results without knowing more about heredity than that certain qualities they desired to enhance were somehow transmitted from parents to offspring. If one desired to create a race of morons it could be accomplished with little difficulty. To be sure, a race of geniuses cannot be produced so simply. Nevertheless, with all our ignorance of the many factors involved in this exceedingly complex problem, there is not the least doubt that by the selec-

tion of the proper stocks the proportion of superior minds could be very greatly increased.

In his zeal to refute the eugenists on all counts and to deprive them of all excuse for existing, Mr. Darrow questions whether after all the race would be better off if it had more intelligence. Assuming that we could accomplish "the elimination of morons, idiots and imbeciles, and at the same time vastly increase the numbers of the intelligent, scholarly and well disposed, I repeat," he declares, "it is not at all certain that it would be desirable to accomplish this result." Are not the morons important, "even more important than the geniuses"?

In its practical aspects eugenics, like other disciplines which have to do with the conduct of life, is based upon judgments of value. In the best of all possible worlds there would be no place for the reformer. The eugenist desires a world in which there is less hereditary defect and infirmity, and more fine physique; less feeble-mindedness, epilepsy, and insanity, and more minds of a high order of intelligence. If anyone is perfectly satisfied with the status quo, or if he prefers more instead of fewer morons and lunatics, there may be no way of bringing him around by logic. The end to be realized is a matter of taste about which it is useless to argue. One's position in such a question depends largely upon his outlook on life. One may be sufficiently cynical to be opposed to all efforts to promote human welfare. Or he might choose as an ideal to be

realized a population of half-witted and contented souls with no aspirations beyond the satisfaction of their daily wants. I do not suppose that this is Mr. Darrow's ideal. His aim is a bit higher, perhaps, but he is apparently quite content with the race as it is with all its burden of hereditary defect and with a few criminals now and then to relieve the monotony of respectable people. At least he would not have anyone raise a hand to reduce the burden. He would have us treat these unfortunates humanely, but he is up in arms against any attempt to prevent their being born.

The real source of Mr. Darrow's antagonism to eugenics is the anti-regulation complex to which I have previously alluded, He is "alarmed at the conceit and sureness of the advocates of this new dream" and is led to "shudder at their ruthlessness in meddling with life." For him the whole eugenic program "means the absolute violation of what men instinctively feel to be their inherent rights. Organized society shall say who must and must not breed, and establish stern rules for picking out mates." This is, of course, simply a ridiculous exaggeration of the aims of sensible eugenists, and is largely the product of Mr. Darrow's overwrought imagination, but it reveals quite clearly his tender spot and the basis of his opposition.

It is somewhat anomalous to find the defender of the theory of evolution playing the rôle of an opponent of eugenics, which is concerned with the further evolution of the human species. But Mr. Darrow the evo-

lutionist and Mr. Darrow the defender of the criminal and the downtrodden are two quite different persons. In championing the cause of the Jukes versus the Edwardses, and the morons in general versus "all the good and solid citizens," he has taken a new case, which he has argued not like a scientist endeavoring to get at the truth, but like an attorney striving to make a strong impression on the jury; and the various arts appropriate to the latter function he has employed with his customary adroitness. Chief among these is the device of placing his opponents, who it must be borne in mind are eugenists in general instead of certain individuals only, in a false and unfavorable light. When one is attacking a general doctrine it is obviously unfair to pick out the most unreasonable statement of it that can be found and treat it as representative of the position attacked. If, for instance, Mr. Darrow seriously believes that eugenists are endeavoring to enact stern rules for picking out mates he must be incredibly ignorant of the literature in this field. There is little evidence of balanced judgment, restraint, or candor in Mr. Darrow's article. He has worked himself up and let himself go, with the result of producing an impassioned diatribe, full of misconceptions, misstatements, and half-truths which may be very well suited to impress the jury, although they would have little effect upon a discerning judge.

I have dwelt upon Mr. Darrow's article, bad as it is from the standpoint of scientific criticism, because it

exemplifies a fairly common attitude. Let us now turn to a critic from the ranks of the scientists, Dr. Raymond Pearl. Being a geneticist and a biometrician who may also be classed, I hope without offence, as a eugenist, Dr. Pearl has no hesitation in declaring that "all the more critical evidence indicates that man is not different from other forms of life in respect to the mechanism by which his characters are inherited," and he also holds that mental traits are to a large extent determined by the genetic composition of the individual. In conceding that "the solid achievements of critical, scientific eugenics are unquestionably considerable," he stands in sharp contrast to Mr. Darrow, who either does not know that scientific eugenics exists or is not disposed to admit it if he does. Dr. Pearl is persuaded that the people he calls the "orthodox eugenists" have drawn many unwarranted conclusions, besides being very rash and culpable in their propaganda. In a paper presented before the Fifth International Congress of Genetics he proceeds to set forth what "a rather extensive acquaintance with the literature of eugenics" leads him to conclude are the chief tenets of the eugenic gospel. The first article of faith is conceived to run as follows: "That all important characters of human beings, physical, mental, and moral, are to such an overwhelming degree determined by heredity, in the sense that these characters will be similar in the offspring to what they were in the parents, that any other factors which may be involved in their determination are rela-

tively unimportant from a racial point of view." This statement is quite obviously an exaggeration of the typical position of the party attacked. Surely even an orthodox eugenist would not deem environment so negligible that he would take no pains to keep his children out of unhealthful surroundings or away from evil associates. But perhaps Dr. Pearl does not mean to accuse his opponents of quite so absurd a contention, since he has introduced the qualifying phrase "unimportant from a racial point of view." But just what is meant by the term "racial" in this connection is somewhat puzzling. If it is equivalent to "hereditary," the sentence means that only hereditary characters are important from a hereditary point of view, which is of course true but not very enlightening. But disregarding this ambiguity, it seems clear that Dr. Pearl wishes to convey the impression that the orthodox eugenists hold very extreme and out-of-date views on heredity, and with this we may pass to his statement of the second article of faith, namely: "That since superior people will thus necessarily have, in the main, superior children, and inferior or defective people will necessarily have inferior or defective children, in the main, the welfare of the race demands that every possible means should be taken to encourage superior people to have large families, and to force inferior people to have small families, or even better none at all." There is a basis of truth in this statement although it is wrong in its emphasis and in some respects misleading. If the

term "inferior people" includes more than the lowest stratum who might well be institutional charges (and it might logically be held to embrace the lower 50 per cent of the population), there are few eugenists who would go so far as to "force" this group to have small families or none. There is a vast difference between effecting a reform by force and gaining the same end by less violent means. Consequently I might suggest that the substitution of some milder expression, such as "induce" or "persuade" would more accurately describe the real attitude of most eugenists and at the same time permit their proposals to appear a little less obnoxious to the general public.

The third article of faith, which concerns the inequality of races and the results of race mixture, need not here concern us.

Having furnished the eugenists with a set of doctrines which, I am sure, no cautious eugenist would accept in the form stated, Dr. Pearl makes the startling announcement concerning these theses that "they are all based upon, and derive their entire meaning from what is now known to be a profound fallacy. This fallacy is that the essence of heredity is comprehended in the statement that 'like produces like.' The epoch-making achievement of genetics during the last quarter of a century is the complete, comprehensive, and general demonstration that heredity does not mean that 'like produces like.' Do two Andalusian fowls mated together produce offspring 'like' themselves? Do any

two individuals heterozygous in respect to any of their characters produce offspring 'like' themselves? What man, or class, or race of men is to be regarded as homozygous in respect to all characters? Has the superlatively important lesson which Johannsen's beans taught the world been so soon forgotten? Or have the eugenists never heard of it? Apparently not. For their public teaching, their legislative enactments, and their moral fervor are plainly based upon a pre-Mendelian genetics, as worn out and as useless as the rind of yesterday's melon."

This is truly an amazing passage! The simple reader after being flabbergasted by its rather impetuous pronouncements would probably be in doubt as to whether it is now permissible to believe that superior people tend to have superior children, or whether, as Bateson has expressed it, any kind of parents can have any kind of children, as they do in novels. If he were unacquainted with statements which Dr. Pearl has made on the subject elsewhere the reader might infer that the genetics of the novels is the kind favored by the author. Observe that Dr. Pearl does not deny that like does, as a matter of fact, produce like, for he knows very well that it does, but he attempts to minimize the importance of this principle. He tells us that this principle does not constitute the "essence of heredity," and that eugenists are sadly in error in thinking that it does. We might say that the essence of heredity is better expressed by the statement that like genes produce

like genes. Certainly no one would deny that it is largely due to heredity that like tends to produce like in the organic world, but it is also due to heredity that offspring are frequently different from their parents. But even the offspring of Andalusian fowl are "like" their parents in 50 per cent of the cases, and the other 50 per cent are "like" more remote ancestors. It is much the same with the offspring of heterozygous forms in general. The demonstration that heredity may cause offspring to be different from their parents is no "epoch-making achievement of genetics during the last quarter of a century," because everyone knew it before. One can find pages of illustrative examples in the works of Darwin and the older hybridists. The important contributions of recent genetics have to do with the definite mathematical ratios observed in segregation and the reasons for this kind of distribution. Everyone with an elementary knowledge of genetics knows, as it was known in a general way for a long time, that the appearance of an organism gives no certain indication of the character of its progeny. But notwithstanding this fact one does not expect Negro children from Chinese parents. As experience has abundantly shown, conclusions and practices based on observed uniformities of descent are by no means useless, even though they are founded on facts that were known before the rediscovery of Mendel's law.

And now for "the supremely important lesson" to be drawn from Johannsen's beans. What is it that Johann-

sen's experiments have taught us? It is simply that selection is effective in forms which present hereditary differences and ineffective in forms which do not. An ordinary bean population consists of a considerable number of homozygous self-fertilizing strains. Mass selection of the heaviest beans in a mixed population is capable of raising the average weight of beans owing to the isolation of genotypes with heavy seeds. Within each self-fertilized strain selection is of no avail. There is no very important lesson for the eugenist in the latter fact, because human beings do not fall into self-fertilizing pure lines. To the extent that a population is heterozygous for several factors influencing the development of a character, selection is to that extent effective, whether one is dealing with human beings or any other kind of organisms. It is not the eugenists, apparently, who have forgotten the lesson of Johannsen's beans.

Our scrutiny of the passage quoted from Dr. Pearl discloses the fact that most of the statements are either untrue, half true, or in some respects misleading. No fact in genetics is better established than the effectiveness of selection when one is dealing with characters for which the group is heterozygous. Multiple factor characters are frequently capable of continuous modification through several generations by the old-fashioned but nevertheless very successful method of selecting as parents those individuals in which the character is developed to the highest degree. Inasmuch as intelli-

gence probably depends upon a considerable number of factors for which the general population is heterozygous, and since it shows a decided tendency to run in families, we have every reason to expect, according to the principles of genetics, that it could be increased by the proper selection of parents. It is not a little remarkable that the facts to which Pearl appeals in order to discredit the conclusions of the eugenists are the very ones which, if analogy counts for anything at all, yield the strongest support to the eugenist's position.

But Dr. Pearl has not been content with reproving the eugenists for their alleged shortcomings. He has attempted to strengthen his case by making an inductive study of the genetics of superior ability. Taking as a criterion of superiority the fact that an individual has one or more pages devoted to his biography in the eleventh edition of the Encyclopaedia Britannica, Dr. Pearl states that these noteworthy people spring, as a rule, from the ordinary ranks of humanity. Among the philosophers, who as a group must owe their fame to the superior qualities of their minds, it turns out that out of the forty-eight about whose parents any information could be gained, the fathers of eleven were petty or higher office holders; four fathers were merchants or shopkeepers; four were lawyers; four were clergymen; four were college professors; three were physicians; two each were in the classes of farmer, weaver, watchmaker, and titled family, and one each in ten occupations varying from fisherman and saddler

to schoolmaster and historian. According to Pearl, the list "is mainly composed of mediocre people, with a few superior persons in the lot, and a few baldly inferior. But to try to make a case from this list that 48 out of the 63 most eminent philosophers that the world has ever known were engendered by superior persons would be arrant nonsense." But is it? The one thing that stands out conspicuously in this list is that it is *not* an average cross-section of humanity. It is of course not to be expected that forty-eight of the world's most distinguished philosophers would have fathers of a comparable degree of eminence, but one would expect to find them distinctly above the general level. If Pearl's data mean anything at all they certainly show that this is the case. We could not reasonably expect these fathers to be in positions occupied by only one out of a hundred thousand of the population. We might expect to find some of them, on account of educational, economic, or other handicaps, occupying relatively humble stations. We should expect more of them to be in pursuits requiring more intelligence and learning than is found in the rank and file of human beings, i.e., gaining their living as office-holders, lawyers, physicians, and professors, who are represented in the list in vastly greater percentages than in the general population, especially when we consider that the median date of birth of the philosophers was the year 1656!

Patterson and Williams have applied the Barr occupational ratings to the fathers in Pearl's group with

some rather striking results. Those fathers having the high rating of 15 or over constitute 63.6 per cent of the group of philosophers, 33.3 per cent of the poets, 48.6 per cent of the scientists, and only 2.2 per cent of the adults in California according to the 1910 census! The unskilled and semiskilled contribute relatively small percentages of distinguished men, as they are shown to do in several other investigations of a similar kind.

Pearl's argument breaks down all along the line. His results are, as he admits, objectively much the same as those of Galton. The difference is due to the fact that, unlike Galton, he has drawn the obviously wrong conclusion from his data. This is because he has classed as "entirely mediocre" people who we have every reason to believe are distinctly above the average of their fellows.

So far as their actual findings go, the various investigators who have studied the familial distribution of intelligence are in substantial agreement. They show that according to all the measures of intellectual superiority in our possession, like tends to produce like to a very considerable degree. As we have shown in a previous chapter, great men are *not* born to stupid parents. The parents may not have been distinguished, because very exceptional minds require a peculiarly fortunate combination of genes. Some stocks are comparatively rich and others are very poor in the component hereditary factors for superior intelligence. There would inevitably be considerable variability in the intellectual develop-

ment of members of the same family, as there is in the development of physical traits. This fact, however, should not prevent us from recognizing that offspring resemble their parents in intelligence as they do in other characteristics, and to the extent that this resemblance occurs, the conclusions of the eugenists rest upon a statistically sound basis of facts.

The varied manifestations of heredity have been emphasized also by Dr. H. S. Jennings in his excellent book *The Biological Foundations of Human Nature.* Although Dr. Jennings's exposition of the principles of genetics and their application to problems of human heredity is carried out with admirable clarity, there are a few of his deductions concerning eugenics with which I am compelled, however reluctantly, to differ, and which are all the more unfortunate on account of the outstanding merits of the rest of the volume. As Dr. Jennings has pointed out, two parents may each have several hereditary defects, but if these are due to different genes, each defective gene of the mother may be prevented from doing harm by a normal dominant gene from the father, and consequently the children may all be normal and considerably superior to both parents. "Thus," says Jennings, "parents both of whom are slow, foolish, lacking in interest and ambition may produce children that have none of these defects, but are quick, intelligent, industrious, ambitious, and so forming what we call superior individuals. This is in large measure the origin of superiority, of genius, in

man." And in his little volume entitled *Prometheus* Dr. Jennings makes the statement that "so long as biparental inheritance is kept up, the variety, the surprises, the perplexities, the melodrama, that now present themselves among the fruit of the human vine will continue. Capitalists will continue to produce artists, poets, socialists, and laborers; laboring men will give birth to capitalists, to philosophers, to men of science; fools will produce wise men and wise men will produce fools; who mounts will fall, and who falls will mount; and all the kinds of problems presented to society by the turns of the invisible wheel will remain."

It is easy to find in the genetics of plants and animals many parallels to such kaleidoscopic changes as those described. It is dangerous to conclude, however, that because one may get a purple sweet pea by crossing the proper varieties of white peas, an industrious son might arise from the mating of two lazy parents. Such a result *might* happen; it is quite in accordance with recognized principles of genetics; but as a matter of fact there is no ground for believing that heredity would work out in this manner for this particular trait. As to fools producing wise men, there is very good evidence that heredity does *not* work out in this way. Wise parents may have a foolish son or daughter on account of a peculiar combination of recessive genes, but there is, I believe, no clearly established case of a wise man having been procreated by two fools.

In his discussions of eugenics Dr. Jennings has made

use of *a priori* arguments based on the principles of genetics with little reference to the actual evidence at hand. The large amount of investigation on the transmission of mental traits he has practically ignored. One may speculate as to what *might* happen in the transmission of human intelligence and find genetical analogies for almost any kind of a conclusion that suited his taste, but to get at the actual facts it is necessary to fall back upon the inductive method.

Dr. Jennings does not go so far as to conclude that a great mind is as apt to arise from one mating as from another. He admits that "by increasing the propagation of the 'superior' groups . . . the general level is, however slowly, raised." However, "From the great mass of mediocre parents arise more superior offspring than from the few distinguished parents; more inferior offspring than from the inferior parents. And superior parents often produce mediocre or inferior offspring; inferior parents at times produce mediocre or superior offspring. In consequence of this situation, decrease or even complete stoppage of the propagation of the 'superior' individuals, or of the 'inferior' individuals has very little effect on the average grade of the next generation."

If this is a true picture of the situation the working of the present differential birth rate will do little harm, at least for a long time to come. Most of what Dr. Jennings has said is unquestionably right in principle; but it is, I believe, wrong in its emphasis. If instead of

saying, "A million 'superior' individuals doubtless produce a somewhat greater proportion of 'superior' offspring than do a million inferior individuals," he had used the stronger expression "very much" in place of the apologetic "somewhat," his statement would have been more in accordance with the actual results of investigation. If I were to assert that a superior person would be "somewhat" more apt to appear among the descendants of Charles Darwin than among those of Max Juke or the Pineys of New Jersey, my caution might well be regarded as unduly excessive. Human society is much more stratified than Dr. Jennings's picture of it would lead one to infer. The mediocre people, so called, who produce distinguished men are for the most part not the same kind of mediocre people who produce the lower levels of the human breed. It is quite misleading to represent human kind as consisting of a thin layer of superiors at the top, another thin layer of inferiors at the bottom, with the vast middle portion consisting of fairly uniform mediocrity. There are all gradations in this middle layer, and where we draw the line between mediocrity and the upper and lower strata is entirely arbitrary. How greatly the sterility of either the superior or the inferior strata would affect the average quality of the offspring of the entire group obviously depends upon the numbers of individuals involved. If the superiors included only those whose names appear in the Encyclopaedia Britannica, their sterility would have relatively little influence on the

proportion of superior minds in the next generation, but even this loss would include a considerable list of great men. If the non-perpetuating group comprised the upper 25 per cent of the population, the effect on the general intellectual level of the race could not fail to be both rapid and serious. What is the real situation? Let us look at the parentage of our group of philosophers, which, though small, is fairly typical of the parentage of intellectually prominent people in general. In the non-perpetuating class, according to the present distribution of birth rates, would be included the five higher political office holders, to say nothing of the six petty office holders. We should have to include the four lawyers, the four college professors, the three physicians, and the historian, probably also the four clergymen, the manufacturer, and the schoolmaster, and perhaps the merchants and shopkeepers. But disregarding doubtful cases, we have quite evidently thirty of the forty-eight parents of philosophers belonging to groups which at present are failing to perpetuate their numbers. It is not necessary to repeat the facts discussed in the previous chapter on the differential birth rate. These facts indicate in the clearest manner that inadequate reproduction is not confined to the relatively small number of distinguished people. It reaches rather far down in the upper levels of humanity and includes most of the stocks from which people of distinction arise.

Whether we study the parentage of gifted children

in our schools, the fathers of American men of science, or those of the worthies mentioned in the Encyclopaedia Britannica or the Dictionary of National Biography, we find the same inadequate reproduction. The really prolific belt consists of those occupying a position between mediocrity and the very lowest mental levels. Out of this group come relatively few people of intellectual distinction. On the other hand, it is the great source of the hopelessly inferior types of humanity. It may furnish numerous recruits to the upper 50 per cent of the population, but they will be largely confined to the lower levels of the upper group.

The picture of the eugenic situation presented by Jennings is based not on a study of the relevant facts, but upon a purely imaginary supposition as to what might happen in accordance with genetic principles. His treatment of this topic is consequently apt to prove more misleading than enlightening to the general reader. Evolutionary changes in the human species are by no means necessarily slow. How rapidly the intellectual level of the race is being changed depends on the kind and the extent of the selection that is now going on. If everyone capable of acquiring a high-school education were to become completely sterile the race would be getting more stupid at a rate which is depressing to contemplate. The actual situation is, of course, far from being as bad as this, although we seem to be making some approach to this unhappy state.

Dr. Jennings, despite his criticisms, is in essential

agreement with the general standpoint of the eugenists. As a good geneticist he could not well be otherwise. But he has, I believe, unduly minimized the importance of the differential birth rate, and he has done this because he has approached the subject chiefly from the *a priori* standpoint and dealt with an imaginary condition instead of the real one.

One of the arguments frequently advanced to demonstrate the futility of eugenics is the clearly established fact that environment is an exceedingly potent factor in determining the number of individuals who attain intellectual distinction in any country or period of time. It is then maintained that environment is much more important than heredity in the production of superior minds. The fact stated by Cattell that "a boy born in Massachusetts or Connecticut has been fifty times as likely to become a scientific man as a boy born along the southern seaboard from Georgia to Louisiana" is due much more to the accidents of the environment than to the quality of the germ plasm. Unquestionably, as Lester F. Ward so frequently contended, a large amount of ability has been suppressed, and prevented from developing, by lack of opportunity. The number of great men has greatly increased as civilization has advanced, but there is little reason to believe that human heredity has made any noteworthy improvement within historic times. This fact, however, is no proof that hereditary factors are of little influence in causing intellectual differences among men.

A favorable environment does not create genius; it simply enables us to discover the genius that already exists. In fact, it serves only the more clearly to bring out the innate differences between human beings, because those with native talents will take advantage of their opportunities, while the born dullards will advance but little, however much may be done to promote their development.

In the present chapter I have endeavored to state some of the more important criticisms directed against eugenics and to meet them fairly. The silly notion that the eugenists propose to have people mated arbitrarily by some sort of a board I have not thought worth while to discuss. Neither am I giving any serious consideration to the strictures of Mr. G. K. Chesterton or Mr. G. Bernard Shaw. For the reader who has had the patience to follow the present volume thus far a rebuttal of the criticisms of either of these entertaining gentlemen would, I hope, be superfluous. After all, perhaps the best procedure is to present a fairly adequate idea of what rational eugenics really is, and then much of the nonsense that is written on the subject, both pro and con, will be appraised at its true worth.

Some writers appear to be troubled over what kind of people we should aim to produce as a result of eugenic breeding. They seem to have the idea that we should agree upon a certain type of human excellence and then proceed somehow to develop it. Then we might imagine people arguing as to whether the ideal

man should be tall or short, dark or light, sanguine or phlegmatic in temperament. But agreement on matters of this sort is the last thing that is desirable from the standpoint of eugenics. There are, however, certain matters about which there is no room for disagreement among sensible people. We should all like to see the race freed from its hereditary feeble-mindedness, epilepsy, insanity, and the many weaknesses and defects that cause life to be a burden to so many afflicted persons. There is little room for difference of opinion about the desirability of good health, energy, and long life. Most of us would like to see the race include a larger proportion of superior minds and a smaller proportion of border-line individuals and dull normals. There would doubtless be a large majority vote for greater physical beauty, and for normal, wholesome, and cheerful dispositions.

It would be ridiculous to attempt to make all human beings conform to any one ideal type. There are many kinds of human excellence, and what we need is variety. Tastes differ in regard to people, as they do in other things, and it takes many kinds of people to make a satisfactory world. Beyond preventing the perpetuation of the feeble-minded, the insane, and the bearers of some other grave hereditary defects, no sensible eugenist proposes to enforce any arbitrary restrictions upon the reproduction of any class of the population. At the same time it is highly desirable that many kinds of

people have fewer children, and that the finest types of people should have more. How these ends can be accomplished is the great practical problem of eugenics. What it may be feasible to do about it we have reserved for discussion in our final chapter.

CHAPTER VII

What Can We Do About It?

A CONSIDERATION of the facts presented in the previous chapters leads us to the conclusion that our race is at present in a relatively dysgenic stage of its biological history. If this conclusion is true, it is highly important that it should be generally recognized. And when we are clearly aware of our racial ills we are brought face to face with the further problem of what can be done to get rid of them.

Procedures for race improvement fall under two classes: (1) those coming under negative eugenics, whose aim is to eliminate bad heredity, and (2) those classed under positive eugenics, which is concerned with efforts to increase good heredity. In general, people are agreed that several kinds of hereditary defects should be gotten rid of to the extent that this can be done without recourse to objectionable methods. Granting that society has the right to protect itself by checking the increase of hereditary defectives, the question inevitably arises as to what degree of defectiveness would justify a denial of the privilege of reproduction. The numbers involved in such a prohibition would obviously be greatly affected by our standards of classification. There

are more morons than idiots and imbeciles, and more border-line and dull normals than morons. Whether we adopt as a standard of feeble-mindedness an I.Q. of 65, 70, or 75 would make a very great difference in the percentage of the population that would fall into the feeble-minded class. There have been several estimates of the percentage of mental defectives in various countries, and in specific areas which have been more or less intensively investigated, and the results naturally vary because of the employment of different standards of classification. The Mental Deficiency Committee which made a careful survey of selected areas of Great Britain stated that out of a total of 623,000 inhabitants, 8.6 per 1,000 were mentally deficient in the sense of this term defined in the Mental Deficiency Act. The total number of mental defectives in England and Wales was estimated on this basis to be 288,600, or about 8 per 1,000 of the total population. On January 1, 1929, there were only 64,253 feeble-minded and epileptics under institutional care in the United States with its 120,000,000 inhabitants, and this evidently means that only a small percentage of these defectives were confined in institutions. Studies of the percentages of feeble-minded children in our schools furnish much higher ratios. According to the report of a survey made by the National Committee for Mental Hygiene in eleven states and two cities and covering 52,514 children, 1,659, or 3.2 per cent, were found to be mentally defective; 4,693, or 9.0 per cent, were border-line and

subnormal cases; 177, or 0.3 per cent, were neurotic; while 78, or 0.1 per cent, suffered from epilepsy. A survey of the Los Angeles public schools revealed that 4.35 per cent of the children had an I.Q. of less than 70. The extensive army mental tests covering about 2,000,000 men indicated that 6.2 per cent of the drafted recruits had an I.Q. of less than 60, but these results are not closely comparable with those just quoted.

The insane, like the feeble-minded, are much more numerous than is indicated by any official figures. On January 1, 1929, the total number of the mentally diseased in the state hospitals of the United States was 272,527. In 1923 the state hospitals for the insane included 85.9 per cent of the insane under institutional care, so that the total number in hospitals of some sort in 1929 would doubtless be over 300,000. The insane hospital population is subject to a rapid turnover, as is indicated by the fact that in 1922 there were 89,383 admissions, 25,656 deaths, and 52,777 discharged as either improved or cured. Pollack and Malzberg have estimated that 4.5 per cent of the people born in the State of New York may be expected to become inmates of a hospital for the insane sometime during their lives. In other words, about one out of twenty-two individuals may look forward to having an attack of insanity at some period of life—a cheerful prospect.

The financial burden imposed by the defective classes is difficult to estimate with precision, although it is

known to be enormous in amount. To the cost of maintaining hospitals must be added the loss of the earnings of the inmates. Pollack estimates that the total losses due to the insane in the State of New York alone for the year 1928 amounted to $143,602,253. The cost of the feeble-minded, in and out of institutions, would greatly augment this amount. The average income of each person in the United States is quite a few dollars less because of the burden of the defective classes.

What is the most feasible and humane way to check the multiplication of mentally defective stocks has been the subject of much controversy. There are laws prohibiting the marriage of the feeble-minded, the insane, and, in some states, the epileptic, but they are quite inadequate to prevent the propagation of these undesirables. Among the feeble-minded, illegitimacy is so prevalent that the prohibition of legal marriage has little effect. Among the insane, marriage is usually contracted before the outbreak of insanity, and hence legislation against the marriage of the insane cannot be expected to accomplish a great deal.

In 1900 Mr. W. D. McKim published a volume entitled *Heredity and Human Progress* in which he presented a vivid picture of the evils resulting from bad heredity and advocated a "gentle and painless death" as "the surest, the simplest, the kindest and most humane means" of checking the propagation of our degenerate classes. Although the author's proposal was ably defended, there is not the slightest chance of its being

adopted, so we shall confine our discussion to the two methods actually employed, namely, segregation and sterilization.

Segregation has not always been successful in preventing the reproduction of defectives, since many children have been conceived and born in almshouses and other places of confinement, but such contingencies can be prevented in properly managed institutions. There are many individuals who require permanent segregation, such as the hopelessly insane and some of the feeble-minded. The serious problem is what should be done with the numerous individuals who in the interests of society should not be permitted to transmit their defects. Mr. E. R. Johnston, the superintendent of a large institution for mental defectives in New Jersey, remarks that no state affords institutional care for more than one-tenth of its feeble-minded and epileptics. Unquestionably if proper accommodations were supplied for all these unfortunates the expense of their maintenance would be increased several fold. If the taxpayers had to foot the bill and realized how much it was costing them they would, I suspect, be disposed to look for some other solution of the problem.

Several states have now passed laws permitting the sterilization of certain classes of institutional inmates. Investigation of numerous cases has shown that sterilization has no marked effect upon the sexual impulses of either men or women; it simply destroys the power of reproduction. As yet sterilization has not been car-

ried out even to the moderate extent permitted by existing statutes. In several states the laws are practically a dead letter. According to Landman, only 12,145 legal sterilizations had been performed in the United States up to January 1, 1932, 5,613 on males, and 6,532 on females. California leads the list of states with a total of 7,548 operations, or more than those performed in all the other states combined.

In California, as a rule, inmates of insane asylums and institutions for the feeble-minded are sterilized before they are discharged. The feeble-minded who are released are kept under supervision, and if their conduct is not satisfactory they are liable to be returned to the institution. The objection is often raised that sterilization would act as an incentive to sexual promiscuity, but the careful studies of Dr. Paul Popenoe on the careers of sterilized defectives have shown that, as a matter of fact, it has not acted in this way. This is an encouraging fact when it is considered that a large proportion of the girls were sexually delinquent before their commitment. In fact, it is this type of mentally deficient girl who is usually sent to an institution. The fairly satisfactory conduct of these girls after their release on parole is not of course due to their sterilization, but to their being placed under the supervision of responsible people. If lapses from grace happen occasionally, as they are bound to do under the best of regulations, posterity will not be burdened with their illegitimate offspring. In California the released girls

often marry, and a study of their marriages showed that they have been, on the average, as successful as could have been expected. The men who marry these girls are thereby prevented from having legitimate offspring, but considering the strong tendency for like to mate with like, the mental level of these men is not apt to be high, and the race is probably all the better for the loss of their genes. The marriage of these girls affords an additional safeguard against delinquency, and helps them to live a reasonably happy life. So far as Dr. Popenoe's studies have shown, sterilization in California, where it is combined with a policy of supervision, is working in a very satisfactory manner.

The alternatives to sterilization are either to allow these defectives to get along as best they can and perpetuate their defects, or to segregate them where they cannot reproduce. The first of these alternatives is highly undesirable both from the eugenic and from the social point of view. The second policy is not only expensive, but it involves the incarceration of individuals for a good part of their natural lives. What society wants of the defective is good behavior and no offspring. If these ends can be gained without undue sacrifice of personal freedom, it would seem desirable from every point of view to adopt such a policy.

There is no good reason why all persons suffering from obvious mental defect or disease should not be prevented somehow from reproducing their kind. But how rapidly could hereditary mental defect or disease

be thus eliminated from the population? The claim has been made, especially by those who are antagonistic to eugenic measures, that even if all defectives were sterilized, their decrease would be so slow as to be practically insignificant. This conclusion is based on two assumptions: (1) that mental defects are inherited as recessive traits, and (2) that matings occur at random. Since the sterilized individuals are liable to have defective offspring, society would at least gain something if these offspring were kept from being born. Defects would still continue to come from the great reservoir of carriers who are somatically normal. If mental defectives constituted one-third of 1 per cent of the population, and they were all sterilized or segregated, the number of defectives would, on these assumptions, be reduced over 11 per cent in the first generation. The reduction would be less in the next generation, and would occur much more slowly as the proportion became reduced, but all the gains would be permanent. In other words, if the proportion of defectives were reduced in the first generation by 11 per cent, this diminished proportion would occur in each succeeding generation.

If all defectives were prevented from reproduction, their reduction in number would probably take place much more rapidly than it would according to the assumptions upon which the preceding calculations are based. In the first place, the assumption of random mating is quite unjustified, since it never occurs among

human beings. People mate, as a rule, with others who have lived for some time in the same area. If a recessive gene arises by mutation it inevitably spreads for several generations without becoming manifest, as it can appear only when it is joined with another recessive gene of the same kind. If an individual having a recessive trait marries someone living in his neighborhood, he is much more likely to select someone heterozygous for the same trait than if the mating were entirely at random. Mental defect is apt to prevail in limited geographical areas in which there has been more or less inbreeding. Consider such groups as the Jukes, the Pineys of New Jersey, the Dwellers in the Vale of Siddem, and other notorious families; there we find striking illustrations of this fact.

Moreover, in addition to the influence of geographical propinquity there is another important influence in the tendency to assortative mating. Since people of low mentality tend to mate with their own kind, a larger proportion of defectives would be produced than under perfectly random matings. This tendency is fostered by the influence of economic pressure, which tends to bring people of low intelligence together in the same occupations and geographical areas. Both in the slum areas of cities and in isolated rural districts one often meets with ne'er-do-wells whom the struggle for existence has forced into a common locality. There are thus several factors which conspire to bring about marriages between people of low mental development, and hence

the prevention of reproduction in this class would reduce the number of these undesirables much more rapidly than it would if matings occurred entirely at random.

The assumption that mental defect is due to factors which are completely recessive may also be questioned. There are, however, certain fairly specific types of low-grade imbecility or idiocy which are probably dependent upon typically recessive genes. The ordinary feeble-minded and high-grade morons, on the other hand, may be considered as constituting the lower end of a series of grades leading up to the higher types of intelligence. As we have seen, the number of differing genes involved in the fluctuations of intelligence is probably very great. The lower mental levels may be said to have a poor collection of genes, while the higher levels have a much better collection. Although it seems probable that most of the hereditary factors making for superior intellect are dominant, we are by no means assured that they are completely so, or that some of the genes that tend to cause mental inferiority may not have a dominant, or partly dominant, effect. Matings of feeble-minded with so-called normal people result in a considerable percentage of feeble-minded children. This, I suspect, is due to the fact that the so-called normals do not have a particularly good combination of genes, and when some of the poorer sets of these genes combine with the poorer sets from the feeble-

minded partner the result is not propitious for the offspring.

Studies of such notorious stocks as the Jukes, Kallikaks, Zeros, and the London paupers whose pedigrees have been so well worked out by Lidbetter, show how much society might have gained by a little wise restriction of the divine right of procreation. There are at present formidable legal difficulties, to say nothing of further obstacles arising from public sentiment, in the way of prohibiting reproduction to all who in the interests of society should not have children. Most eugenists would, I believe, favor greater restriction of reproduction in the so-called social problem group. It would scarcely be feasible with our present mores to deny the privilege of parenthood to the border-line and dull normal people, from whom so large a part of our morons are recruited. As is stated in the report of the Mental Deficiency Committee, if we collected the families having one or more children certifiable as mentally deficient, the group "would include, as everyone who has extensive practical experience of social service would readily admit, a much larger proportion of insane persons, epileptics, paupers, criminals (especially recidivists), unemployables, habitual slum dwellers, prostitutes, inebriates and other social inefficients than would a group of families not containing mental defectives. The overwhelming majority of the families thus collected will belong to the lowest 10 per cent of the social scale of most communities. . . . Of the members of this sub-

normal group, only a small proportion, certainly not 10 per cent, are of sufficiently low grade to be certifiable as mentally defective on any standard at present accepted." To get rid of most of our hereditary defectives, therefore, it would be necessary to sterilize or segregate this lowest 10 per cent of the entire population, and this is an obviously impracticable measure. For this reason it may be desirable to consider what may reasonably be expected from birth control.

The birth control movement was primarily inspired by the humanitarian motives of mitigating poverty and relieving overworked mothers from the burdens of frequent childbearing. These are obviously worthy aims, but, as matters worked out, the limitation of offspring came to be practiced not so much where it would do the most good, as among the more educated and well-to-do. Whatever may be said for birth control on humanitarian grounds, it must be conceded that, up to now, its influence has been chiefly dysgenic. It is quite evident that birth control has great possibilities as a means of racial improvement, but, as Mr. Wiggam has remarked, it is a two-edged sword. Is it likely that this powerful instrument will come to be used so as to promote the progressive development of human kind?

The proponents of birth control explain that it is one of their chief objects to extend the blessings of family limitation among the lower social and economic classes where it is most needed, and thus to correct the evils of the differential birth rate. It is certainly true that

the practice of contraception has filtered downward through the ranks of society, and this movement has been considerably accelerated in certain parts of Europe since the World War. Edin finds that among the industrial workers of the city of Stockholm the birth rate is lower than it is among the bourgeoisie. According to Grotjahn, in the city of Bremen, which is one of the few cities of Germany in which births are tabulated for occupational groups, there has been a relatively greater decline of the birth rate in the laboring population than in the wealthy and middle classes, so that the differences are not nearly so great as they were a generation ago. It would be of much interest to learn how far the same phenomenon is characteristic of other cities, both in Germany and elsewhere. So far as evidence is at present available, there is not sufficient ground for concluding that the condition is very widespread. Where the birth rates of the different social classes have been nearly equalized the total birth rate has fallen below what is required to perpetuate a stabilized population. If this condition were to continue, all classes would eventually become extinct together.

There is more or less danger that the practice of contraception among the proletariat will be employed most by those who are the most intelligent and enterprising, and that this class will lose more of the fine hereditary stocks that it still contains. What we want to get rid of most of all is the miserable social problem group, which is a fertile source of so much of our

human wreckage and failure. If charity officers, social workers, physicians, and others in touch with people of this kind would exert their influence to induce these people to go to birth control clinics where the necessary information and devices would be furnished free of cost, much might be done to limit the propagation of a class which it would not be feasible to segregate or subject to compulsory sterilization. Many of this group would doubtless be only too glad to stop having children if it could be done without taking too much trouble or costing any money. Unfortunately the technique of contraception is not entirely foolproof, and moreover some of the more shiftless and improvident would continue to procreate children through sheer negligence and inertia, but a large proportion of those who should not have children might be led to limit their families if doctors, social workers, and I should like to add priests and ministers—all those who stand in the relation of guide, philosopher, and friend to these struggling souls—were to give them the benefit of their judicious counsel. Voluntary sterilization by vasectomy would afford a very simple solution for the growing burdens of an increasing family that had to be supported on a small wage, but it suffers from the drawback that if the financial conditions of the family should improve, it would no longer be possible to have more children. The operation has not yet become popular, although it is sometimes resorted to when no more children are desired. On the whole, sterilization on

other than eugenic or hygienic grounds should not, as a rule, be performed, but it would, I believe, be undesirable at present to regulate the practice by law. Where sterilization is justified on eugenic grounds, and these should include the sterilization of high-grade morons and other undesirable kinds of parents, physicians should be free to proceed at their own discretion. Negative eugenics based on voluntary action has much wider possibilities as a means of race improvement than any compulsory measures which can be carried out in a democratically governed people. Arbitrary interference should be reduced to a minimum, even in matters of eugenics. With the diffusion of knowledge of eugenics among those in a position of leadership and influence, a great deal can be accomplished toward the elimination of bad heredity and the lightening of some of the burdens for which bad heredity is primarily responsible.

In turning to the consideration of positive eugenics, or procedures for the increase of good heredity, we encounter a problem which may well give us pause. In the near future, at least, there is little to be hoped from legislation. No democratically governed community in the present age of unenlightenment would support any measures for favoring the well-born at the expense of the ill-born. All the discriminations that meet with favor work in the reverse direction. Bertrand Russell is convinced that eugenics and democracy will not mix. Commenting on the fact that "the most intelligent in-

dividuals on the average do not breed enough to keep their numbers constant," he remarks: "Unless new incentives are discovered to induce them to breed, they will soon not be sufficiently numerous to supply the intelligence needed for maintaining a highly technical and elaborate system. And new incentives will have to be far more powerful than any that seem politically feasible in any measurable future. In America and Great Britain the fetish of democracy stands in the way; in Russia, the Marxian disbelief in biology. Wherever the Catholic Church is strong, mere quantity tends to be thought alone important. In France, the economic system that has grown up around the Code Napoleon makes any eugenic reform impossible. Probably the best chance is in Germany, but even there it is small. Meanwhile, we must expect, at any rate for the next hundred years, that each generation will be congenitally stupider than its predecessor."

It would be very easy to devise schemes, as Plato did, which would greatly improve the race in a few generations, but it is quite certain that Demos would not submit to them. We may, therefore, dismiss the thought of accomplishing eugenic reform by act of Parliament and consider what other possibilities lie before us. Many schemes for race improvement have been proposed, and unquestionably a few of them have some merit, while others are as wildly impracticable as those advocated by Plato. The eugenic proposals set forth by Galton in his essay on *The Possible Improve-*

ment of the Human Breed under Existing Conditions of Law and Sentiment were advanced with much circumspection, almost with timidity. With the conservatism characteristic of a cultured Englishman of his time and social class, Galton was careful to advocate no measures which would not be likely to meet with popular approval. He made no appeal for governmental action, for he well knew that nothing could be expected from that quarter. He sought to attain his ends by education, persuasion, and the enlistment of private beneficence, which might enable superior young couples to marry early and raise a fair-sized family. He clearly realized that what is of greatest importance for eugenics, because it is basic for everything else, is the proper kind of education. Eugenic procedures would meet with little approval in an ignorant and poverty-ridden community, nor would they make any more headway in a cultured class which did not "believe in heredity." Among a people knowing enough to appreciate the value of eugenics, which most educated individuals certainly do not at the present time, much might be done to encourage the increase of better stocks. I must confess that Galton's suggestion of "granting diplomas to a select class of young men and women" and all similar schemes, such as offering prizes for fine families, are a bit too naïve for a sophisticated and cynical world. It is too much like giving fancy colored cards for attendance at Sunday school. A more sensible measure advocated by Galton is "the provision

to exceptionally promising young couples of healthy and convenient houses at low rentals." In fact, this scheme has actually been put into practice at the Jardins Ungemach in Strasbourg through the philanthropic efforts of Mr. Alfred Dachert. The Jardins Ungemach is a eugenic city on a small scale. The houses are furnished at a reasonable rental to healthy and intelligent young couples, and if the occupants prove to be infertile they are replaced by more promising candidates. The object of the enterprise is to increase the birth rate among people of superior quality, and to judge from the results already achieved, the experiment has proven quite successful in this respect.

It may not be unreasonable to hope that Mr. Dachert's excellent example may be followed by other philanthropists, but even if such enterprises were multiplied many times they would go only a short way toward curing our dysgenic ills. As a rule business executives are not much concerned over the reproductive performances of their employees. Theoretically it may be claimed that wages should be based on the amount required to support a man, his wife, and at least three children on a decent standard of living. On this basis a large porportion of wage earners are receiving bonuses for wives and children that they do not have. According to the estimates of Professor Paul Douglas, were all workers in the United States to receive the wages required to support a normal family on a fair subsistence level, the expense would amount

to 82 per cent of the total income of the United States, leaving only 18 per cent, which is inadequate to cover the various other items of expenditure. The Australian Commission on the Basic Wage appointed in 1919 reported that a wage necessary to support a normal family "cannot be paid to all adult employees, because the whole produced wealth of the country, including that portion of the produced wealth which now goes in the shape of profits to employers, would not, if divided up equally amongst employees, yield the necessary weekly amount." A similar situation, according to the studies of Mr. Rowntree, Sir Josiah Stamp, and Professor Bowley, prevails in Great Britain, and it is probably quite general elsewhere. What happens, therefore, is that in a large proportion of wage-earners' families, the children suffer.

As a matter of social justice, a man should have sufficient wages to enable him to marry and raise a family of the size needful to perpetuate the race. On the other hand, an employer cannot be expected to pay a laborer more than his labor will produce. And yet the interests of the man's wife and children demand that adequate support be forthcoming from somewhere. But where? The effort to meet this situation has given rise to the system of family allowances, whereby the burden is shifted from the shoulders of the individual employer and transferred either to the state or to a group of employers belonging to the same general industry or situated in the same area. In Europe the sys-

tem of allowances for the support of children has spread rapidly since the war. It has not made much headway in England, and still less in the United States, but in France the number of compensation funds increased from 0 in 1920 to 230 in 1930, with expenditures increasing from 4,000,000 to 350,000,000 francs, or about $13,000,000. Recently (1932) a law has been passed in France making family allowances compulsory for all employers. Every employer must affiliate with some compensation fund, and allowances are paid for all children, illegitimate and legitimate alike. To a less degree the family allowance system has been adopted in Germany, Austria, Belgium, Holland, Denmark, Norway, Sweden, Finland, Italy, Poland, Czechoslovakia, Jugoslavia, Australia, and New Zealand. In no country do the stipends allowed for children come near paying for their support, although they sometimes materially assist families to maintain a fair standard of living. If they have had any effect on the birth rate it has not as yet been sufficiently marked to be clearly demonstrable. Probably they will not have much influence on the birth rate until they become considerably increased in amount, and how they may affect the distribution of births then is a question upon which opinions differ.

Theoretically it would be easy to devise a system that would increase births in any class one desired to favor. Such a system has been outlined by Dr. William McDougall in his volume entitled *Is America Safe for*

Democracy? "What is required," according to Dr. McDougall, "to counteract the very powerful dysgenic influence of the economic consideration, or prudence, is that every family which has risen above the mean social level (or, better still perhaps, every family which has any good claim to belong to what may be called 'the selected classes') should know that the addition of each child should automatically bring with it an increase of income sufficient to meet the expenses normally incurred in the bringing up of that child. It is clear that, in order to meet this requirement, the amount of increase of income would have to bear some given proportion to the income already enjoyed or earned. This increase of income should, I suggest, be not less than one-tenth of the earned income, and might well be rather more. A family earning an income of $2,000 a year would then receive, for each living child under the age of twenty years, an additional income of $200 a year. If such increase of income, proportional to the earnings and to the number of children, could be secured to each family of the selected classes, the eugenic effect would, I submit, be very great, far surpassing in this direction the effect of any other eugenic measure that has been proposed; while it would do nothing to diminish the natural and proper incentives to effort, and would not in any way tend to diminish the sense of parental responsibility or to weaken family ties."

There is, I believe, no doubt that some such system

would have a good eugenic effect if only people could be persuaded to adopt it. Dr. McDougall would begin by applying the system to selected servants under state and municipal employ, there being some small precedent for this action in both the British and the American army. With the system established in schools and colleges supported by the state, endowed institutions of learning might be led to follow suit, partly out of regard to public sentiment, and partly as a means of meeting competition. As to how family allowances may be extended to the fields of private enterprise Dr. McDougall is less explicit. He has suggested "the setting apart of a national sum for the supplementing of salaries of selected workers," but his evident misgivings as to the feasibility of this scheme have prompted him to make the alternative proposal, "In view of the difficulty of moving legislatures to action directed to the good of posterity, it seems probable that the best hope of instituting the new plan lies in the possibility of raising the required national fund by appeal to private beneficence." With the attitudes prevailing at present or likely to prevail for many years to come I can imagine how far such an appeal to private beneficence would be likely to get. The French system of distributing the burden of family support among groups of employers would seem to have the greatest promise of success because an adequate allowance would involve simply an increase in the assessments already paid. Even if the allowances were considerably increased,

the total cost to employers need be no greater than under the present system, because the basic wage in every industry would be reduced so that the unmarried workers would receive less, while the workers with families would receive more. Inevitably a system of family allowances must work out in this way in the long run. The laborers would have no just grounds for complaint if they have families or look forward to having them, as most of them do. There are advantages in the system from the standpoint of both the employer and the employed. It is a noteworthy fact that in France the allowance system was at first opposed or viewed with suspicion by the labor unions, but now they regard it quite generally with favor.

If family allowances are to exert any marked eugenic influence not only would they have to be increased in amount, but they would have to vary with different employments. There is, of course, no more injustice in this than there is in the fact that people are much better paid in some pursuits than in others. In a given industry allowances based on a certain percentage of the wages would probably not greatly increase the total amount expended for labor; they would simply effect a redistribution of wages within each class of employees. If a graded system were put into operation by the several industries it probably would not meet with as much opposition as it would if invidious distinctions were made by the state.

It is generally conceded that allowances given indis-

criminately to all classes would stimulate the birth rate to the greatest extent among the less provident and thrifty elements of the population. Some students of the subject, notably Carr-Saunders and Miss Rathbone, have expressed doubts that the system would work out in this way. In this connection Professor Pigou has remarked: "It must be remembered that, as things are at present, members of the very lowest economic class do not regulate the size of their families by economic considerations, and that their children, if they cannot themselves support them, are in fact supported at the public expense. Hence a bounty, based on the size of families, among manual wage earners generally would not cause the lowest type of wage earner to have more children than he does now." On the other hand, Professor Pigou is of the opinion that the "higher types of wage earners would thus come to have larger families than before relatively to the lowest type of wage earners as well as, perhaps, relatively to the professional classes," thus leading to an expansion of the middle section of society at the expense of both extremes. A somewhat similar opinion is expressed by the able and enthusiastic champion of family allowances, Miss Eleanor Rathbone, who states that "direct provision for raising the standard of life of the poorer wage earning classes, will substantially lower their birth rate as a whole. . . . It will probably raise, but not to a large extent, the birth rate of artisan, lower, middle and struggling professional classes. It will not affect the birth rate of the

well-to-do, except that by raising the status of marriage and motherhood it may slightly increase the number of children from the abler mothers."

If the system would work out in accordance with Miss Rathbone's prediction it would be an improvement over our present method of dysgenic breeding, but I am not convinced that undiscriminating allowances would not make matters worse. Family allowances could, I believe, be so distributed as to meet all the requirements of social justice and humanity and at the same time promote the increase of better hereditary stocks. A good deal of missionary work will have to be done in educating the public before it will be willing to adopt such a system. This is an unfortunate circumstance, because the proper distribution of family allowances affords the most feasible of all the schemes ever advanced for the promotion of positive eugenics.

There are a few organizations in which a family allowance system has been in practice for several years. Ministers in the English Methodist Church have received an annual allotment for each child, and an additional amount during the child's later years in school. Foreign missionaries in the Baptist and Congregational churches receive a fairly substantial allowance for each child, so that the financial burden of a large family is in many cases no greater than that of a small one. This may explain the facts that the families of these missionaries are considerably larger than those of ordinary ministers, and that the missionary birth rate has shown

little decline for several years. Roberts College in Constantinople and the American University at Beirut have allowances for the children of their faculty members, but the most noteworthy experiment in this direction was inaugurated a few years ago by the London School of Economics, which pays to members of its faculty an allowance for each child during its period of education. The stipends are £30 a year between the sixth and the thirteenth year and double this sum while more advanced studies are being pursued. It will be a matter of interest to see what effect these allotments will have on the faculty birth rate. We may hope that they will be sufficient to encourage other institutions to follow the worthy example of the London School.

While we may expect the greatest eugenic reform from the removal of the penalties of parenthood, we must not lose sight of what may be accomplished in other ways. One very desirable accomplishment is the more successful treatment of sterility. Among people whose low birth rate is to be deplored are unquestionably many who want children but who are unable to have them. A woman's likelihood to conceive falls off rapidly as age at marriage increases. Many women go for years hoping that they may have a child, but hesitating to consult a physician in order to remedy their disability; or they may have consulted physicians in vain and accepted their sterility as an irremediable misfortune. In a fairly large percentage of cases the fault lies with the husband instead of the wife. He may

be affected with azoospermia or be sterilized by having both vasa deferentia blocked through a previous attack of gonorrhoea. In either case the prospect of curing the trouble is small. Sterility is more often curable in women, but frequently it baffles the most highly qualified experts. Unquestionably the kind of life now led by most women is not conducive either to the development of their physical strength or to the proper discharge of their reproductive functions. What modern women need is to get out and do a lot of vigorous work in the open air. If they were to spend some of their time in pitching hay and hoeing corn, like some of their great-grandmothers, instead of making their living by pounding a typewriter in an office or waiting on customers in the breathed-over atmosphere of a department store, their physical health would be greatly improved and there would be much less complaint over inability to bear children.

Another feasible means of eugenic reform is the improvement of sexual selection. Among all peoples choice in marriage depends upon standards which are influenced to a considerable degree by education. If knowledge of the fundamental principles of heredity and eugenics should haply come to be possessed by most of the inhabitants of a nation, it might do much toward promoting race betterment. Consider, for instance, the pedigree of a blind family described by Loeb. The blind father had three blind sons and one blind daughter. Although these sons had every reason

to believe that they inherited their blindness from their father and would be likely to transmit it to their descendants, they all married, and in each case produced two or three blind children. One of the latter married and inflicted his infirmity on three of his four

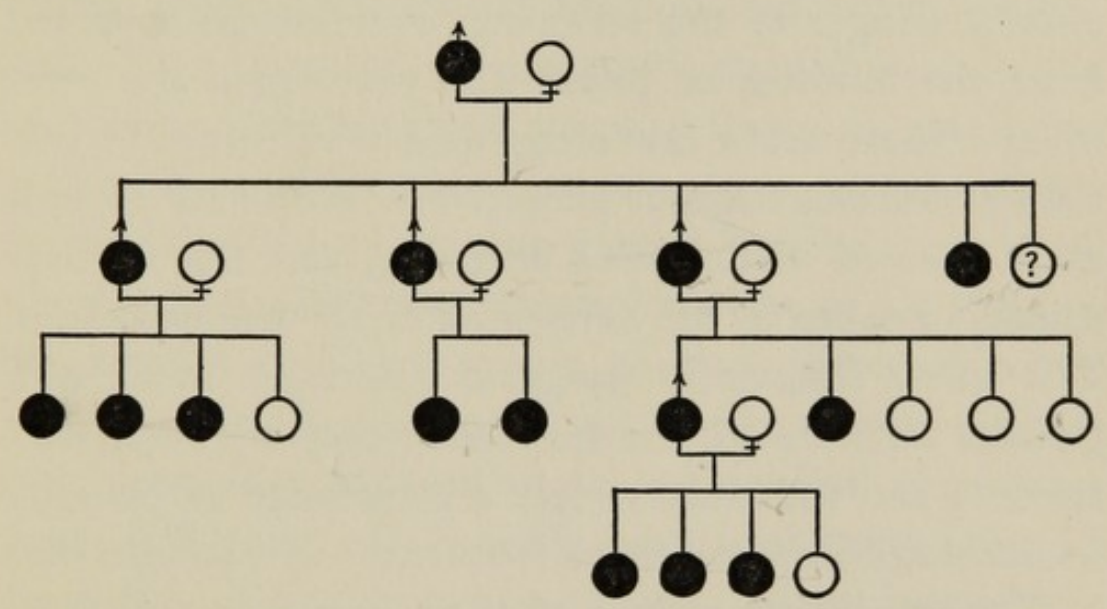

FIGURE 4. Pedigree showing heredity of blindness. (Data from Loeb.) The blind are represented by dark circles.

offspring. In another pedigree described by Professor Karl Pearson a woman with the deformity known as lobster claw transmitted the defect to twenty-five of her descendants through four generations. Being a dominant character which incapacitates its possessor for most kinds of work, its hereditary transmission was perfectly obvious, but this fact was not sufficient to conquer the reproductive urge of the many individuals responsible for the perpetuation of this unfortunate peculiarity. Cases like this, showing an amazing disregard for the welfare of offspring, to say nothing of the interests of

society, could be repeated many times. Such obviously dysgenic breeding would not be tolerated by most tribes of savages, but in civilized mankind this sort of thing excites little comment. One cannot help wondering if any of these marriages, so obviously fraught with the gravest danger to the offspring, ever caused a protest from the minister or priest who performed the ceremony. There are a few clergymen who refuse to officiate at the marriage of people who are likely to produce diseased or defective offspring, and this attitude should be taken by all clergymen of all denominations. The more frequently dysgenic marriages meet with general disapproval, the less likely they are to be contracted; and the more widely a knowledge of heredity becomes diffused, the more frequently will people with hereditary defects refrain of their own free will from passing them on to their children.

Eugenic education, I am convinced, cannot fail to be of service also in positive eugenics. Many people are seriously concerned over the probable quality of their future offspring. Students of biology have not infrequently told me that their attitude towards marriage and having children had been radically changed as a result of what they had learned about heredity. Most intelligent young people who are contemplating marriage have at least the intent to choose wisely, and they usually want a number of healthy and intelligent children, although of course not too many. There are good reasons for believing that a little knowledge of heredity

makes them more discriminating in the choice of a life partner.

Sexual selection is a means by which ideals of manhood and womanhood may, in a measure, effect their own realization. If such selection is to achieve its best results these ideals should be high and widely prevalent. The education of our youth should include the knowledge which would prepare them to make the proper choice in marriage, not merely on account of the happiness of the contracting parties, but for the sake of the children which may result from the union. Galton has remarked: "The passion of love seems so overpowering that it may be thought folly to try to direct its course. But plain facts do not confirm this view. Social influences of all kinds have immense power in the end, and they are very various. If unsuitable marriages from the eugenic point of view were banned socially, or even regarded with the unreasonable disfavour which some attach to cousin marriages, very few would be made."

What has been said of the importance of eugenic knowledge for the improvement of marriage selection applies also to all other methods of eugenic reform. Eugenic education is the *sine quâ non* for the adoption of any kind of measures looking toward race betterment. It is as necessary for the cure of our dysgenic ills as a knowledge of medicine is for curing the ills of the body. Our race is in much the same position as a patient in declining health who is not convinced that anything

is the matter with him. To make the comparison more precise we must suppose that the patient is very obstinate and full of prejudices against medical science, and that he is prone to bamboozle himself into the notion that his symptoms have no significance, and that he is really getting stronger and better every day and in every way. Obviously the first thing to be done in such a case is to educate the patient. Then when he begins to have some sense in regard to his physical condition there comes the problem of inducing him to take the necessary treatment. Will the patient prove amenable? From what I know of his mental outlook I fear that he will be a rather intractable customer. There are certain kinds of palliative treatment to which he may be persuaded to submit readily enough, and he may perhaps be slowly educated so that he will take kindly to more and more remedial procedures. But I seriously doubt if his basic troubles can be overcome, so that he can be started on the road to a really sound and healthy state, under our present economic system. At least some effective method must be adopted for relieving the better endowed types of some of the burdens of family support, if we expect them to produce sufficient offspring to continue their stock. With all that can be accomplished through eugenic education, and with all our preaching of the racial obligations of superior individuals, when it comes to the question of another baby versus a better standard of living and better provision for the children already born, the

usual decision will be against another baby. That one more child is required to make the average quota needed to perpetuate the stock will not, as a rule, have sufficient persuasive force to cause parents to have a third or a fourth child. Even their love of children would prevent this if the newcomer threatened to deprive those already born of the advantages required for their best development.

With the propagation of the race brought entirely under voluntary control—a condition that we seem to be rapidly approaching—it is an open question whether human beings will reproduce with sufficient rapidity to escape eventual extinction. Where parents have to bear all the financial burdens of family support under circumstances which render these burdens increasingly difficult to carry, the temptation to restrict the birth supply below the reproductive level will probably prove too strong to be resisted. Some system whereby the burdens of rearing children are, in a measure, eased for capable parents is apparently an essential condition for any real eugenic improvement. There is no doubt that, in the near future at least, the opposition to any such scheme would be formidable. It can be overcome, if at all, only gradually. A system such as is now in operation in France might gradually be developed into a fairly satisfactory eugenic program, if the stipends for children came to be more nearly adequate, and were based on a certain percentage of the parent's earnings. In this country at the present time there would be

strong opposition to going even as far as the French have gone. We cannot, therefore, look forward to much change in our present dysgenic breeding until there has been a considerable change in the attitude of the public toward proposals of this kind.

There is little use in attempting to work out the details of any system of eugenic procedure before the first steps have been taken to establish it. Details will have to be decided upon as the system develops and in the light of the results already achieved. The vital problem of eugenics may, however, prove too much for us to cope with because we lack the enlightenment and real patriotism needful to plan and carry out any effective measures for racial improvement. Certainly our immediate eugenic prospect is not hopeful. The practical problem of eugenic reform, although a difficult one in a democracy, can of course be solved if a genuine desire for race betterment becomes sufficiently widespread. One encouraging sign is the growing interest shown in matters of human biology. We may, therefore, cherish at least the hope that we may prove capable of extricating ourselves from our present eugenic predicament, but whether or not this hope is vain the future alone can tell.

Eugenics appeals to the unselfish side of human nature, and calls on every generation to work for the future without thinking only of the present reward. Only a strong love of man like the ideals of religion, will enable humanity to attain its true destiny.

Appendix

TO this appendix I have relegated a certain amount of material, some of it in tabular form, which bears upon various topics discussed in the preceding pages. This has been done to relieve the reader from the interruptions which would be occasioned by the inclusion of statistical data and other detailed evidence for the conclusions set forth. There are a few books in which the appendix constitutes the most valuable and interesting part. Possibly there will be some readers who will find this to be the case with the present volume.

A. TUBERCULOSIS IN IDENTICAL TWINS

As an illustration of the light which the study of twins is throwing upon obscure problems of human heredity I may cite the results of some investigations on the liability of different classes of twins to contract tuberculosis. The extent to which tuberculosis depends upon a hereditary diathesis has long been a subject of controversy. That the disease shows a tendency to run in families is abundantly demonstrated by the investigations of Riffel, Pearson, Goring, Govaerts, and several others, but the familial occurrence of tuberculosis may possibly be due simply to infection instead of

heredity. Among guinea pigs it has been demonstrated by controlled experiments that tuberculosis is more apt to occur in certain strains than in others. It is a familiar fact that some races of man contract tuberculosis very readily, while the white race seems to have developed a certain degree of immunity to this disease. But the immunity of the white race does not necessarily prove the existence of a greater degree of hereditary resistance. Immunities may be slowly built up by minimal infections acquired in childhood. For this and other reasons the demonstration that people vary in their inherent powers of resistance to tuberculosis has been lacking in conclusiveness, however probable it may appear to be in the light of the available evidence.

The recent studies on tuberculosis in identical and fraternal twins have given us what is almost equivalent to a crucial experiment on this problem. Diehl and Verschuer have collected a number of most significant observations and their results, combined with those which have been reported by others, are expressed in the following table:

	Group I	*Group II*	*Group III*
Identical twins	13	4	2
Like-sexed fraternal twins . .	8	14	16
Twins of unlike sex	4	6	8

In Group I are included those cases in which tuberculosis is manifested in practically the same way in the two twins both as to the organs affected and as to the time of onset. Group II comprises the cases

in which both twins were tuberculous, but in which the disease appeared at different times, attacked different parts of the body, or was only temporary in one member of the pair. Group III is composed of those pairs in which only one member contracted the disease. In several instances among the identical twins the members had been long separated and were living under different environmental conditions; nevertheless, the ways in which the infection was manifested were very similar in both individuals. It is a remarkable fact that when tuberculosis attacked one member of a pair of identical twins it attacked both in 17 out of the 19 cases. In 13 of these the disease attacked both twins in a very similar way. Among the ordinary twins of the same sex when one was tuberculous the other was unaffected in 16 out of 38 cases, and if tuberculosis attacked both members it usually affected them in a different manner. The distribution of tuberculosis among the like-sexed fraternals and the twins of opposite sex was much the same. Undoubtedly the environmental conditions are generally more different for twins of opposite sex than they are for fraternal twins of the same sex. Nevertheless, the striking difference occurs between the identical twins as a class and the non-identicals as a class, regardless of the influence of sex and environment.

In all the 6 recorded cases of scrofula (which is a form of tuberculosis) in identical twins, both members were affected, whereas in like-sexed twins of the ordi-

nary type there were 5 concordant and 6 discordant pairs. The described cases of tuberculosis among twins who were diagnosed as identical or fraternal are not as yet very numerous, but the differences are so striking that they afford very strong evidence for the existence of a hereditary diathesis to this disease. A summary of the subject is given in Diehl and Verschuer, "Erbuntersuchungen an tuberkulösen Zwillingen," *Beiträge zur Klinik der Tuberkulose*, vol. 75 (1930), pp. 205-15.

B. HEREDITY IN MENTAL DISORDERS

There are still quite a few alienists who are disposed to minimize the rôle of heredity in causing insanity. Focal infections, disturbances of the endocrine glands, alcoholism, shock, and purely psychological maladjustments have all been emphasized by different alienists as especially potent factors in the production of mental disorders. It cannot be denied that many cases of insanity are attributable to these causes. On the other hand, there are many people whose mental stability is disturbed very little by such factors. Focal infections, whose malign influence upon mental health has been so much stressed by Cotton, are tolerated, even in a severe form, without producing any noticeable tendency towards mental unbalance. They occasion insanity only in certain exceptional individuals. But why this selective action? It would be a matter of much interest to ascertain whether or not such individuals are heterozygous for the hereditary factors which ordinarily

must be present in a duplex state in order to produce insanity without an apparent external cause. The fact that many cures have been reported following the removal of foci of infection has been adduced as a crucial demonstration of the absence of hereditary causes in these particular cases. This conclusion is apt to be drawn by those who take the view that if insanity is hereditary any attempt to cure it is foredoomed to failure. Such a view is held by Cotton (*The Defective, Delinquent and Insane*, Princeton, 1921), who berates the hereditarians for preaching a disheartening and paralyzing doctrine. It is unfortunate that such a misconception of the workings of heredity is so widely prevalent. It creates needless hostility and prejudice on the part of people who are concerned in the alleviation of human ills, and who are unduly alarmed over what one author has termed the "heredity spectre." Like most spectres, this particular bogey is mainly the product of a distorted imagination. A proper grasp of the factorial conception of heredity would, I believe, dispel much ill-grounded alarm over the alleged fatalistic implications of genetics. It would also make it apparent that the rôle of heredity cannot be disposed of by showing that a character varies greatly in response to environmental influences. Let us suppose, for instance, that an insane patient is cured by the removal of tonsils or the extraction of a bad tooth. According to the prevalent manner of looking upon heredity, this fact would seem to exclude the possibility that heredity played any part in

producing the disorder; but, plausible as this conclusion may seem, I am not convinced that it is justified. Many people who are hereditarily more or less disposed to insanity may become insane as a result of influences which would have little effect upon normal individuals. They may also be "cured" of their insanity by procedures which improve their physical health or promote their peace of mind. These cures, therefore, do not afford any conclusive evidence bearing on the existence of a diathesis to insanity.

We may, of course, be accused of advancing a purely formal argument to bolster up the position of the hereditarians, but the view taken is supported by much evidence, and it affords a reasonable interpretation of many facts. When we interpret the familial distribution of insanity in its various degrees and forms, it should be borne in mind that dominance is frequently a variable and uncertain characteristic. There are not a few pedigrees of insane individuals which seem to indicate the existence of dominant, or partly dominant, factors. In such instances heterozygous individuals may have become insane as a result of unusually provocative conditions or the influence of other associated genes. It is a noteworthy fact that among the relatives of the insane there is commonly a high percentage of persons who, while they are not certifiable as insane, are nevertheless eccentric or peculiar. Several prominent students of the genetics of insanity, i.e., Rüdin, Hoffmann, Strohmeyer, and Kretschmer, regard such individuals

as heterozygous for a factor which tends to produce insanity, but which is only partially effective in a single state. Eccentric or psychotic people are especially prevalent in the pedigrees of patients with schizophrenia, or dementia praecox, and they are therefore designated as schizoid. People with schizophrenia often come from schizoid parents and have schizoid offspring. This fact is well illustrated in the pedigree of the brothers Otto and Ludwig, kings of Bavaria, whose familial history of insanity has been worked out by Strohmeyer. Both of these brothers are regarded by Strohmeyer as cases of dementia praecox, although their symptoms were dissimilar in several ways. The father and the mother of Otto and Ludwig were both mentally unbalanced (schizoid), as were three of the grandparents. In the generations intervening between these brothers and William the Younger, who is described as a typical dementia praecox case, there are several persons classed as schizoid in the inbred lines of this notorious family.

As a rule little account has been taken of the eccentricities and milder forms of mental alienation among the relatives of insane patients. It is difficult enough to get reliable information concerning those members who are unquestionably insane. In several recent studies of the inheritance of insanity more attention has been devoted to those individuals who are on the borderland of mental alienation. Such investigations are of great value in relation to the genetics of insanity and they also have an important bearing on practical eugen-

ics, since a considerable proportion of the insane come from parents one or both of whom exhibit some degree of mental abnormality. The marriage of the eccentric relatives of the insane is therefore not to be advised.

Since insane people commonly come from presumably normal parents and produce children who usually pass muster as normal, the conclusion is frequently drawn that heredity is a relatively unimportant factor in the causation of insanity. The inheritance of insanity is a matter upon which it is highly important that we arrive at correct conclusions. For this reason I am citing the results of some further investigations bearing on this problem.

Konstantin ("*Zum Problem der Erbprognosebestimmung*," *Zeitschrift für die gesamte Neurologie und Psychiatrie*, Vol. 125 (1930), pp. 103-33), finds that among the siblings of 296 cases of dementia praecox there were 10 with the same form of insanity, 1 with manic-depressive insanity, 5 with psychoses of uncertain classification, 5 feeble-minded, 6 who were peculiar, and several others who were mentally abnormal. Among the 786 nephews and nieces there were 7 cases of dementia praecox, and 2 with manic-depressive insanity. A much smaller percentage was affected among the more remote relatives.

Luxenburger has found that in Bavaria the children of parents with dementia praecox are eleven times as apt to have that form of insanity as are children in the population at large. Oppler ("*Zum Problem der Erb-*

prognosebestimmung," *Zeitschrift für die gesamte Neurologie und Psychiatrie,* Vol. 141 (1932), pp. 549-616) found 28 cases of dementia praecox out of 488 children of 109 dementia praecox parents.

In studying the pedigrees of 85 cases of manic-depressive insanity, Bunse ("*Zum Problem der Erbprognosebestimmung,*" *loc. cit.,* Vol. 119 (1929), pp. 576-612) found 19 relatives with the same type of insanity, 19 others suspected of having the same type of insanity, 18 who were cycloid, 1 with dementia praecox, 5 feeble-minded, 5 psychopathic, and several others who were mentally abnormal. Of the 170 parents of these 85 cases, 7 had insanity of the same type, 11 were suspected of having the same type of insanity, 8 were cycloid, 8 had psychoses of uncertain type, and several others had mental or nervous disorders of various kinds. Even among the cousins the incidence of manic-depressive insanity was twenty-three times as high as in the general population.

Dr. A. M. Barrett ("Hereditary Relations in Schizophrenia," *American Journal of Psychiatry,* Vol. 7 (1927), pp. 77-104) finds among 150 consecutive cases of dementia praecox in a hospital at Ann Arbor, Michigan, 11 instances of psychoses among the fathers and 11 also among the mothers. In 100 selected cases of dementia praecox in which fairly complete information could be secured about the relatives there were 103 mentally abnormal siblings, 35 of whom had dementia praecox and 68 of whom had other psychoses. These

cases were selected on account of the occurrence of one or more mental abnormalities in the families besides the cases of dementia praecox from which the inquiry started. The results show that among these abnormalities dementia praecox is very common. There was only 1 case of manic-depressive insanity among the siblings as compared with 35 cases of dementia praecox. All told, 421 individuals of these families were mentally abnormal, among whom were 8 cases of manic-depressive insanity.

The tendency of dementia praecox and manic-depressive insanity to breed true to type is now abundantly demonstrated. Additional evidence of the most conclusive kind is afforded by the study of insanity in twins as is shown in the data cited in a previous chapter. Some particularly striking cases have been described by Dr. G. H. Parker ("Dementia Praecox in Identical Twins," *Journal of Nervous and Mental Diseases*, Vol. 63 (1926), pp. 135-42), and others have been reported by Frantz (*loc. cit.*, Vol. 50 (1919), pp. 325-30), and by Siemens (*Die Zwillingspathologie*, Berlin, 1924). Further references may be found in the articles by Luxenburger and Von Verschuer in the literature list on the inheritance of mental defect and disease.

The studies of Humm on the distribution of mental defects and diseases in identical and fraternal twins may be summarized in the following table, the data for which are taken from his paper on *Mental Disorders*

in Twins (Dissertation, University of Southern California, Los Angeles, 1930).

	PROBABLY IDENTICAL			PROBABLY FRATERNAL			TWINS OF OPPOSITE SEX		
	Sim.	*Dis.*	*One Nor.*	*Sim.*	*Dis.*	*One Nor.*	*Sim.*	*Dis.*	*One Nor.*
Crime	18	0	1	2	3	6	2	0	12
Manic-depressive insanity	6	2	0	1	0	5	0	0	8
Dementia praecox	9	1	2	5	3	8	0	2	16
Epilepsy	3	1	1	0	1	2	0	0	6
Feeble-mindedness	30	1	1	14	5	13	7	4	14
Total	66	5	5	22	12	34	9	6	56

Sim.: both affected with the same disorder; Dis.: both mentally abnormal, but having different disorders; Nor.: normal. The heading "probably fraternal" includes only twins of the same sex.

The differences between the identical and the like-sexed fraternals as to the proneness of mental disorders to attack both members of a pair are very great. It is surprising that these differences should be so conspicuous in such a characteristic as crime (which cannot of course be properly described as a mental disorder), since crime is generally conceded to be largely a matter of environmental determination. In some subtle way heredity seems to play an important part in making identical twins act so much alike that if one becomes a criminal the other will follow his bad example. These results are confirmatory of the conclusions set forth by Lange in his interesting little volume entitled *Crime as Destiny*. Lange made an investigation of the careers of all the twins who were confined in the prisons of

Bavaria. The twins were divided into the two groups of identical and fraternal. It was found that in the pairs of fraternal twins, if one member was in the penitentiary, the other was no more likely to be imprisoned than any other member of the family. Among the identical group if one member was in prison the other had a prison record in 10 out of the 13 cases. In the 17 pairs of fraternal twins both members had a prison record in only 2 cases. Moreover, the types of crimes committed by the identical twins were very similar, whereas in the two members of the fraternal group the differences in the criminal careers were quite marked. In one of the three pairs of presumably identical twins in which one member did not have a criminal record, the diagnosis of identity was uncertain, and in the two other cases there were evidences of brain injury in one member of the pair. Mere numerical data fail to give an adequate idea of the remarkable similarities in the behavior of the identical twins described in Lange's book. One needs to read the case histories to get the full force of the story.

C. SUPERIOR ABILITY IN TWINS

The so-called twin method has proven no less valuable in studying the heredity of superior mental ability than in the investigation of the rôle of heredity in causing mental defect and insanity. The studies made in Germany on intrapair differences in the intelligent quotients of identical and fraternal twins by Lassen,

Frischeisen-Köhler, and Von Verschuer may be summarized as follows:

	DIFFERENCES IN I.Q.										
	0-1	2-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-
Identical . . .	17	17	7	7	2	..	1	..	..	..	1
Fraternal ..	6	2	4	10	6	3	1	3	2	..	1

As is apparent from the table, the differences in the intelligence quotients of identical twins are, as a rule, much less than those of ordinary twins. Several other studies based on mental tests or scholastic grades have yielded similar results.

A striking case of resemblance in identical twins of very exceptional ability has been described by Gesell. These twins were very similar in almost all their physical measurements and characteristics. Both their palm prints and their sole prints were so similar that they could be described by the same formula. In both twins the upper incisor tooth was in the same incomplete stage of eruption at the eighth year of age, and on the upper lip of both, near the outer corner of the mouth, there was a minute pigmented mole. Mentally both were precocious to a remarkable degree. They began French in their third year and by the time they were four years old they could read elementary French, English, and Esperanto. "Formal arithmetic was begun at six and in less than a year they were solving mentally problems in fractions and percentage. At the age of nine both were doing Junior High School work.

They speak French fluently, and have made progress in Italian, and embarked upon Russian. They are much alike in their tastes and dispositions. Their mental tests and their vocabulary tests give almost the same scores."

The unusual precocity of these twins may be attributed to the circumstance that "scientific and linguistic ability of high order and physical energy are some of the traits which are found in the two immediate generations." The close resemblance of these twins in the high degree of their intellectual development is the combined effect of identical heredity and similar environmental conditions. It is improbable that environment will account for their high intelligence any better than it will account for the similarly situated pigmented moles on their lips.

Not all identical twins, however, are so closely similar in their mental traits, and occasionally such twins may differ rather conspicuously in their physical development. Of course, environment can make differences to almost any degree that is consistent with the maintenance of life. If equal cuttings from the same plant are grown, the one in rich soil and the other on stony ground, they will grow into plants of very unequal size. Similarly, physical or mental inequalities of a striking kind might result in identical twins if the development of one member had been checked by some unfavorable environmental influence.

Identical twins who have been reared apart from an

early age afford very valuable material for the study of the relative influence of nature and nurture in mental development, although the problem, even from a theoretical standpoint, is less simple than it at first appears. Here we can compare individuals with the same heredity under different environmental conditions. In some cases the intellectual similarities of identical twins are very striking even when they have been separated since early infancy. The two identical twin girls, B and J, described by Muller had been separated when they were two weeks old and had not seen each other until they were eighteen years of age, and since then they had been together for only short intervals. The father of B was engaged in logging and mining operations and the family frequently changed its residence. B obtained a business education and engaged in clerical and secretarial work. Her sister J lived on a ranch, went to high school, and spent a short time in a university. Both twins were fond of reading and "both have had two or three attacks of tuberculosis, almost simultaneously. Intelligence tests were given to both twins, and despite their difference in education both made similar scores. On the Army Alpha Test B made a score of 156 and J a score of 153 out of a possible 212. On the Otis Advanced Intelligence Test B's score was 64 and J's 62 out of a possible 75. In speed of reaction to the stimulus of words the better educated twin J responded about twice as rapidly as her sister, while the latter, the typist, exceeded J in speed of tap-

ping. The 'will-temperament' and the Pressey X-O Test for emotions and social attitudes showed rather marked differences in the two twins, which seemed to be correlated with salient differences in their past experiences and habits of life."

From these observations it might be concluded that environment is more influential in determining emotional attitudes and traits of character than the degree of intellectual development. Unfortunately observations on identical twins reared apart are as yet few in number. Dr. H. H. Newman has described a few other cases, some of which exhibit differences in mental traits which are rather greater than the average differences found in fraternal twins who have been raised together, while in other twins the similarities were very close. The twins B and D who had been separated when they were fourteen months of age had not seen each other until their sixteenth year, after which they were together for relatively short intervals. Both married and had children. B, who was in better health than D, had more social poise and also exceeded her sister somewhat in mental tests, the I.Q.'s on the Stanford-Binet Test being B 93, D 89, on the Otis Self Administering Test, B 89, D 86, and on the International Test, B 74, D 69. The mental ages on the Stanford Achievement Test were B 15 years and two months, and D 14 years and eight months. Temperamentally the two twins were very much alike.

In the twins Mary and Mabel the mental differ-

ences were more pronounced. The twins were separated at five months of age, but they had visited each other several times since their adoption into different families. Mary's grade on the Stanford-Binet Test was 106.2, and Mabel's grade was 88.5, the difference of 17.7 points being over 3.3 times as great as the average difference of identical twins reared together and nearly twice as great as the average difference of fraternal twins reared together, which is 9.9 points. Other tests showed roughly comparable differences. In fact, these twins "represent the most extreme differences so far observed in identical twins reared apart." Mary had superior educational advantages, which may have been at least partly responsible for her higher scores. Although these twins differed considerably also in their physical and emotional traits, the similarity of their finger prints, and the identical formulae of the palms of their corresponding hands, render the diagnosis of their identity very probable. In commenting on the results of the tests Dr. Newman remarks that "the tests do show very definitely that different training, different experiences, and different modes of living profoundly affect the intellectual, temperamental and physical characteristics of the individual. They have a considerable share in determining a given person's mental powers, his character, and his physique,—in a word, his individuality."

To a certain extent this conclusion is probably correct, but it does not necessarily follow from the evi-

dence cited. Differences in the intellectual and emotional development of identical twins may be due to other causes besides those which properly come under the head of experience or training. Illness, especially in early life, may be an important cause of differences, and injuries at birth, as we now know, are responsible for a considerable proportion of those cases of arrested mental development due to environmental factors. Intrauterine causes may also play an important part, since there are reasons for believing that interference during development may be greater in identical than in fraternal twins, owing to their very close association and their common placental attachment. In the case of Mary and Mabel, however, the twin who was better developed physically made the poorer score in the mental tests, so that, unless we assume that Mabel suffered from certain obscure cerebral handicaps of which there is no direct evidence, it seems reasonable to attribute her lower rating to her lack of educational advantages; but there are various other possible explanations.

As Carter has shown, identical twins reared together often manifest consistent, though small, differences in their I.Q.'s. Similar differences in physique also occur in identical twins and persist from the period of birth to maturity. Some of these differences are the result of the tendency to "mirror-imaging," or the development of complementary asymmetries which are due to the fact that identical twins arise from a single fertilized

egg. We apparently have in identical twins various degrees of compromise between development as a single individual and development as two entirely separate organisms. This tendency to complementary development is naturally productive of intra-pair differences, and may well lead to certain maladjustments of organization which would affect one member of a pair more than the other. Although the statement may sound a bit paradoxical, the fact that two individuals have a common origin and hence an identical heredity brings into operation developmental influences which tend to exaggerate their differences. As a result of this tendency there are certain features of organization in which identical twins differ more than fraternal twins. We are thus confronted with a curious complication when we employ identical twins in studying the relative influence of nature and nurture in causing differences among human beings.

The intra-pair differences between double monsters are commonly very great, and fairly conspicuous differences are sometimes observed in typical Siamese twins. In the pair of Siamese twins D and V investigated by Koch one member, D, was an inch and a half taller than her sister V, and she also matured somewhat the more rapidly. D was consistently superior in all the intelligence tests that were given, as well as in scholastic abilities in arithmetic, composition, and comprehension of reading, although the differences were

not as great as those between most twins. The Blazec, Hilton, and Godena Siamese twins also exhibit rather striking differences in several features of their physical organization. From the data thus far amassed it appears that Siamese twins differ from each other more than the members of ordinary identical twin pairs. A part of these differences is due to mirror-imaging, and a part is due to other circumstances arising from their close association. Dr. Newman has advanced the plausible hypothesis that the amount of mirror-imaging and other differences in identical twins (including conjoined twins) depends upon the time at which separation occurs in early development; the later the separation, the more unlike are the members of a pair.

The observations made on Siamese twins yield further support to the view that the different I.Q.'s and emotional reactions of identical twins are largely the result of development instead of differences in experience and training. I readily admit that education may make notable differences in the scores made in an intelligence test, especially in those tests which involve a considerable element of information. But to attribute the mental differences in identical twins entirely to this cause is quite unwarranted.

D. THE I.Q.'S OF CHILDREN AND THE OCCUPATIONS OF PARENTS

The several studies that have been made on the relation between the I.Q.'s of children and the occupa-

tional and educational status of parents have yielded similar general results. Haggerty and Nash have studied the parental occupation and the mental capacity of 8,122 rural children in the State of New York, 6,688 of the children being in elementary schools from the third to the eighth grade, the remainder attending high school. The results are expressed in the following table:

Occupation	*Median I.Q.'s, Grades 3-8*	*Median I.Q.'s, high school*	*Percentage of I.Q.'s 140+, grades 3-8*	*Percentage of I.Q.'s 60-69, grades 3-8*
Professional	116	121	11.75	0.00
Business and clerical	107	112	6.04	2.01
Skilled laborers	98	111	1.94	3.59
Semiskilled	95	108	1.15	4.19
Farmers	91	108	.87	6.00
Unskilled	89	106	.40	10.34

Since a number of other investigations have shown the same general trend as is exhibited in the table we shall not adduce further illustrations. That differences in the intelligence of children are manifested from an early age has been shown by Goodenough, who has made a study of the I.Q.'s of preschool children in relation to the occupations of their fathers. Three hundred and eighty children of 18 to 54 months of age were given two tests each about six weeks apart. The results were as follows:

	I.Q.'s OF CHILDREN	
Occupation	*1st test*	*2nd test*
Professional	116.1	125.0
Semiprofessional	111.7	119.7
Clerical and skilled trades	107.7	113.4
Semiskilled	105.3	108.0
Slightly skilled	104.3	107.4
Unskilled	96.0	95.8

It is significant that the intelligence scores of even very young children show very much the same relation to the occupations of their parents that is found in children of school age. As Goodenough remarks, "The fact that no appreciable change takes place in the position of the various occupational groups from the age of two to the close of the elementary school period affords strong evidence that the underlying factors, whatever may be their nature or origin, are non-cumulative in their relative effect upon mental development." In another study Goodenough found that the correlation between the I.Q.'s of preschool children and the intelligence of the father was .264 on the first test and .349 on the second, and that the correlation between the I.Q.'s of the children and the education of the mother was .319 in the first test and .353 on the second. Two hundred and thirteen children were given two tests about six weeks apart.

Witty and Lehman have compared the occupational and educational status of the parents of 50 gifted children with an I.Q. of 140 or over with that of the parents of 50 inferior children with an I.Q. of 70 or less.

The occupations of the fathers of the gifted group fell into three classes of business, 33; professional, 16; and agriculture, 1. The occupations of the parents of the inferior group included 1 druggist, 1 justice of the peace, 2 bootleggers, 2 hucksters, 1 ice-route operator, the rest being mostly laborers and helpers of various classes. In education the parental groups differed quite sharply, as shown in the table:

EDUCATION OF PARENTS

	GIFTED GROUP		INFERIOR GROUP	
	Fathers	*Mothers*	*Fathers*	*Mothers*
High school	43	41	4	1
College	25	25	0	0
Business	4	3	0	0
Elementary school only	7	9	46	49
Average years of school	13	12	4.5	4.0

The hereditarian would naturally attach considerable significance to the fact that among the parents of the inferior group were 35 who were "mentally defective." Among the siblings of this group there were 57 who were "mentally defective," whereas there were no parents or siblings who were rated as mentally defective in the gifted group.

Witty and Lehman have discussed their findings in relation to the problem of the relative influence of nature and nurture in mental development, and find themselves unable to decide as to what interpretation should be adopted. "Who knows what the results would be if the social backgrounds of the two groups

were reversed?" Of course no one knows. Doubtless the showing of the inferior group would have been improved had the children been given better training than they actually received. But that the advantages enjoyed by the superior group would have enabled any considerable proportion of the inferior group to attain a grade of 140 is highly improbable in the light of everything we know of the influence of training on mental capacity. If it were easily possible to overcome the intellectual limitations of a defective child with an I.Q. of less than 70 to the extent of converting it into one with an I.Q. of over 140, the indecision of the authors might have had some reasonable basis. In such problems as this we cannot hope to establish proofs with the conclusiveness of a rigid mathematical demonstration. As in most of the practical affairs of life, we have to arrive at the best common-sense judgment that is possible in the light of the available evidence. In the problem under consideration I can by no means agree that we have reached an *impasse*. We are dealing here, it must be remembered, with differences between I.Q.'s of 70 or less and I.Q.'s of 140 or more. If the environmentalist has really a sound argument he must be able to show that the cause to which he appeals is at least capable of producing the effects observed. We know pretty well by this time that continued training cannot effect any very startling results in increasing the mental capacity of the average mentally defective child. On the other hand, children with a high I.Q. manifest their

superiority at an early period and usually retain it until adult age. That the group with I.Q.'s of 70 or less would have blossomed out into bright children with I.Q.'s of 140 or over had they been raised under the social environment of the gifted group seems, therefore, a bit absurd.

E. FAMILY SIZE AND THE I.Q. OF CHILDREN

There have been several investigations of the relation between family size and the I.Q.'s of children, and they have given results such as might have been anticipated on the basis of the preceding data on occupation and intelligence and the relation between status and the birth rate. In S. Dawson's study of 1,239 children (ages 3-14) of workmen, tradesmen, etc., it was found that, taking mothers of 45 years of age, there was a correlation of —.30 between the I.Q.'s of children and family size, i.e., the lower the I.Q., the larger the family. The average number of children in the families of the bright group (I.Q. 114 and over) was $3.41 \pm .16$, of the medium group (I.Q. 85-114), $4.43 \pm .05$, and in the dull group (I.Q. less than 85) $4.73 \pm .08$. E. J. C. Bradford found a correlation of $-.25 \pm .03$ between I.Q. and family size in 450 city children, and Chapman and Wiggins obtained a correlation of $-.33 \pm .024$ between I.Q. and family size in 650 cases. In England Sutherland has found among the miners, a relatively homogeneous group, a correlation between test scores and number of children of $-.129 \pm .019$ in one group

(1,106 cases) and —.126 ± .015 in another (1,990 cases).

Several studies carried on in Germany have yielded results in general agreement with those cited. The eugenic survey which has recently been carried on in Liverpool has shown that mental defectives come, on the average, from more prolific families than those which produce normal children. In an interesting article on mental deficiency as revealed by this survey, Dr. Caradog Jones states that "these [defect-producing] families are reproducing their kind in numbers larger than families that are normal. Our figures suggest, indeed—I do not claim that they conclusively prove—that there is a definite gradation in fertility: it is highest in families containing more than one defective; it is very high in families with a single defective; it is still distinctly high in families which contain no mentally deficient person but which are sub-normal in some other respect." The average number of children in the mentally defective group was 4.69. The families producing these defectives were largely of the so-called "social problem group."

Ogburn and Tibbitts have investigated the relation between birth rates and occupation on the basis of data furnished by the United States Bureau of the Census. For several years our birth statistics have given for different occupational groups the number of children ever born to women who had given birth to a child during

the year. How far such numbers represent the relative birth rates of women in the different occupational groups has been somewhat uncertain. From their estimates of the number of married women of ages 15 to 44 in the various occupational groups the authors have calculated the relative birth rates of women in these groups. The correlation between the estimated birth rates and the children born per mother in these groups was very high, i.e., .999. There was also a fairly high correlation (.88) between the fertility of women and the intelligence ranks of the occupations as given in the Army Alpha mental tests. The average size of families and estimated birth rates are shown in the following table:

Occupation	*Average Number of Children Ever Born to Women Having a Child in 1925*	*Average Number Born to Mothers Aged 40-44 Years*	*Estimated Birth Rate*
Professional	2.3	4.9	13.1
Managers	2.6	5.3	13.8
Skilled labor	3.0	6.8	14.7
Semiskilled labor	3.3	7.9	15.4
Non-agricultural labor	3.7	8.3	16.3
Agricultural labor	3.7	8.6	16.3
Farmers	4.0	8.0	17.0
Urban	3.1	7.2	14.9
Agriculture	3.9	8.1	16.7

As a result of combining a number of data from several investigations on the relation of family size and I.Q. of children, Dr. Hornell Hart gives the following compilation:

Occupation	*Average Number of Living Children*	*I.Q. of Children*
Professional	2.2	114
Business and clerical	2.5	104
Skilled labor	2.6	97
Farmers	3.4	91
Unskilled labor	3.1	89

On the basis of his study of the differential birth rate in Iowa, Dr. Hart remarks: "The types of individuals who are becoming parents most extensively in Iowa are the tenant farmer, the foreigner, and the badly educated. The types most meagerly participating in the bearing and rearing of children are the economically successful, the native born, the highly educated and the city dwellers. These differences in fecundity are so radical that they cannot fail to have a profound effect upon the types of character produced . . . and hence upon the trend of character of the Iowa population."

The Department of Research of the Milbank Memorial Fund has recently issued a number of studies on fertility in relation to social class and economic status in the United States. These studies were based on data obtained by the United States censuses of 1900 and 1910 but were never tabulated or published. Syden-

stricker and Notestein have analyzed a large sample of this material in their investigation of the number of children born to women in various occupational groups. Data were obtained for 99,226 native-born married women who were living with their husbands, north of Mason and Dixon's line, in 1910. The table gives the number of children ever born per 100 wives in each quinquennial age group under 45 for each urban and rural class.

NUMBER OF CHILDREN

		AGE OF WIFE IN 1910					
Occupation	*Total Under 45*	*Under 20*	*20-24*	*25-29*	*30-34*	*35-39*	*40-44*
Professional	142	35	59	89	133	177	211
Business	145	37	66	104	147	184	224
Skilled workers . . .	170	45	93	137	185	235	277
Unskilled workers .	207	59	113	175	229	296	334
Farm owners	279	50	122	188	265	325	376
Farm renters	246	52	113	195	284	367	467
Farm laborers	232	59	126	221	320	403	471

In the data for the first four occupations, which pertain to the urban population, it will be seen that for the total number of women under 45, as well as for those in each age group, the number of children born per 100 women increases as we pass from the professional class to the unskilled workers. With the rural group, which includes the last three occupations, the wives of the farm owners have had, as a class, more children than those of the farm laborers, but in each separate age

group this relation is reversed. The different trends shown in the several age groups and in the totals are probably due to the fact that many persons begin as farm laborers and later become farm owners, frequently after passing through the stage of farm renters. The group of farm laborers contains many young couples with small families. When these couples attain the status of farm owners their families become larger. The people who remain as farm laborers, however, have larger families than the renters or owners. It is evident that the data for the several age groups give the better index of relative fertility.

The influence of changing occupational status may well be to cause a statistical reduction of family size in the lower occupations in the cities as well as in the country. Probably the predominant trend, especially in this country, is from the lower occupations to the higher ones. Many young people begin their careers as laborers and finally work into some form of business, or more rarely enter the professions. Their families while small get credited to the lower occupation and thus reduce the average family size. Where our data on family size are based upon families which are not completed, then in proportion as people rise in occupational status as they grow older, the family size of the lower occupational groups will appear to be too small as compared with that of the higher groups.

It may be noted in the table that the differences in fertility shown by the totals are not, as a rule, so great

proportionately as the differences in the several age groups. To a certain degree this may be due to a shift similar to that which is indicated in the rural population, although the influence of this factor is less decided. On the whole, it seems not improbable that the fertility of some of the lower occupational groups is relatively too low, and that the real differences in fertility are greater than the figures on family size apparently indicate.

F. FAMILY ALLOWANCES

The Eugenics Society of London has given its endorsement of the family allowance system on eugenic as well as economic grounds. In the statement issued by the Council of the society it is stated: "The great economic advantages enjoyed by children from small families is the most serious obstacle to a successful appeal to those well endowed by nature to make an adequate contribution towards the reproduction of the next generation. In addition, the social promotion, within groups of equal civic worth, of the children from the smallest families, cannot but tend to diminish the innate fertility of the more skilled occupations. For both reasons the economic motive for childlessness should by all possible means be diminished in all classes doing skilled work. The most potent means of effecting this end is a scientifically designed system of family allowances. The aim of such a system should be to equalize the standard of living between parents and non-parents

doing equivalent work, within all grades affected, in such a way that the amounts recovered per child by each class of earner shall be proportional to the earnings. The Society is strongly opposed to redistribution by means of taxation, or to the allowances being made a charge on the State, and favours the establishment of equalization pools among the employing bodies of the salaried professions and skilled occupations."

The family allowance system has been ably championed by Dr. R. A. Fisher in his Herbert Spencer lecture on *The Social Selection of Human Fertility*, and also in an article in the *Eugenics Review* for July, 1932. The same number of this journal contains also an article by C. W. Armstrong in which it is proposed that allowances be granted for children in proportion to the earnings of the parents. The money for the allowance fund is to be gained by the payment into a special bank of a certain percentage of the earnings of all workers receiving over 30s. a week. The allowances for unattached workers and people in the business and professional classes are to be based proportionately upon their contributions to the income tax. Those receiving more than £2,000 a year are not to be recipients of allowances, since their incomes are presumably already adequate. On the other hand, those receiving less than 30s. a week are to be exempt from contributing to the fund and from receiving benefits therefrom, it being deemed undesirable to encourage the propagation of this element of the population.

According to Mr. Armstrong, the advantages of the scheme are that "It converts the present dysgenic system of family allowances into one that will make for race betterment. . . . It embraces every social class which can be considered racially valuable, except perhaps some of the very rich who cannot well be offered this sort of advantage; though there must always be individual cases among both poor and rich which will be exceptions to the rule. It treats all equally, since it offers to every family an endowment proportioned to contributions made, and yet it encourages procreation more or less in proportion to real eugenic value. . . . It imposes extra burdens on none but the idle, the childless, and the very rich, while it benefits all others. Lastly, it need cost the Exchequer very little."

Such a proposal as this will doubtless meet with many objections. There is little doubt, however, that the system would effect desirable changes in our present dysgenic breeding. This fact will, I fear, have little influence in securing the adoption of any similar proposal. What, I suspect, will force the adoption of an effective system of family allowances more quickly than anything else is the prospect of actual decrease in numbers which now threatens several countries of northern and western Europe as well as the United States. So long as births outnumber deaths people will probably be little disturbed over inadequate rates of increase in a stabilized population. Personally, I am convinced that the cessation of population growth is coming consider-

ably more quickly than most experts on population have predicted. I can see no very good grounds for concluding that the decline of the birth rate will not continue, at least for several years to come. There is no reason to suppose that the better situated elements of the population will have more children than at present, while there are fairly good reasons for believing that the birth rate in the proletariat will continue to go down. In a few decades—or at least in a very few generations, but I think it will be a matter of decades—nations may be seriously concerned over ways and means by which they can prevent an actual loss of their population. Then, if they are not overpopulated so that they would welcome a little reduction in numbers, they will have to face the alternatives of encouraging either immigration or the natural increase of their own inhabitants. Either procedure can be eugenic or dysgenic in its effects, depending upon how it is regulated. In the meantime it is to be hoped that sound knowledge of eugenics will become much more widely diffused.

G. BIRTH RATES PER 1,000 INHABITANTS

	England and Wales	*Germany*	*France*	*Italy*	*Sweden*	*Norway*	*U. S.*	*Australia*	*Japan*	*Austria*
1878-82 ..	34.4	38.0	24.9	36.6	29.6	31.0	...	35.2	24.7	38.5
1908-12 ..	25.2	30.0	19.4	32.7	24.8	26.0	...	27.2	32.4	32.2
1918-22 ..	20.9	21.7	17.3	26.4	21.0	24.1	23.5	24.7	33.3	22.8
1923	19.7	21.0	19.1	29.4	18.9	22.5	22.4	23.8	34.9	30.6
1924	18.8	20.5	18.7	28.4	18.1	21.1	22.6	23.2	33.8	30.0
1925	18.3	20.7	18.9	27.8	17.6	19.5	21.4	22.9	34.9	29.4
1926	17.8	19.5	18.8	27.2	16.8	19.3	20.6	22.0	34.8	30.0
1927	16.6	18.4	18.1	26.9	16.1	17.8	20.6	21.7	33.6	28.6
1928	16.7	18.6	18.2	26.1	16.0	17.7	19.7	21.3	34.4	29.7
1929	16.3	17.9	17.7	25.2	15.2	17.5	18.9	20.3	33.0	28.9
1930	16.3	17.5	18.1	26.0	15.4	17.4	18.9	19.9	32.4	...
1931	15.8	16.0	17.4	...	...	...	17.8	18.2	...	...

The birth rates for Japan before 1920, the year of the first census, are based upon estimates of the number of the inhabitants.

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