Being Well-Born

An Introduction to Heredity and Eugenics

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TO MY WIFE

HELEN M. GUYER

Faithful critic, inspiriting friend

PREFACE TO THE FIRST EDITION

One of the most significant processes at work in society to-day is the awakening of the civilized world to the rights of the child; and it is coming to be realized that its right of rights is that of being well-born. Any series of publications, therefore, dealing primarily with the problems of child nature may very fittingly be initiated by a discussion of the factor of well-nigh supreme importance in determining this nature, heredity.

No principles have more direct bearing on the welfare of man than do those of heredity, and yet on scarcely any subject does as wide-spread ignorance prevail. This is due in part to the complexity of the subject, but more to the fact that in the past no clear-cut methods of attacking the manifold problems involved had been devised. Happily this difficulty has at least in part been overcome.

It is no exaggeration to say that during the last fifteen years we have made more progress in measuring the extent of inheritance and in determining its elemental factors than in all previous time. Instead of dealing wholly now with vague general impressions and speculations, certain definite principles of genetic transmission have been disclosed. And since it is becoming more and more apparent that these hold for man as well as for plants and animals in general, we can no longer ignore the social responsibilities which the new facts thrust upon us.

Since what a child becomes is determined so largely by its inborn capacities it is of the greatest importance that teachers and parents realize something of the nature of such aptitudes before they begin to awaken them. For education consists in large measure in applying the stimuli necessary to set going these potentialities and of affording opportunity for their expression. Of the good propensities, some will require merely the start, others will need to be fostered and coaxed into permanence through the stereotyping effects of proper habits; of the dangerous or bad, some must be kept dormant by preventing improper stimulation, others repressed by the cultivation of inhibitive tendencies, and yet others smothered or excluded by filling their

place with desirable traits before they themselves come into expression.

We must see clearly, furthermore, that even the best of pedagogy and parental training has obvious limits. Once grasp the truth that a child's fate in life is frequently decided long before birth, and that no amount of food or hospital service or culture or tears will ever wholly make good the deficiencies of bad "blood," or in the language of the biologist, a faulty germ-plasm, and the conviction must surely be borne home to the intelligent members of society that one thing of superlative importance in life is the making of a wise choice of a marriage mate on the one hand, and the prevention of parenthood to the obviously unfit on the other.

In the present volume it is intended to examine into the natural endowment of the child. And since full comprehension of it requires some understanding of the nature of the physical mechanism by which hereditary traits are handed on from generation to generation, a small amount of space is given to this phase. Then, that the reader may appreciate to their fullest extent the facts gathered concerning man, a review of the more significant principles of genetics as revealed through experiments in breeding plants and animals has been undertaken. The main applications of these principles to man is pointed out in a general discussion of human heredity. Finally, inasmuch as all available data indicate that the fate of our very civilization hangs on the issue, the work concludes with an account of the new science of eugenics which is striving for the betterment of the race by determining and promulgating the laws of human inheritance so that mankind may intelligently go about conserving good and repressing bad human stocks.

In order to eliminate as many errors as possible and avoid oversights I have submitted various chapters to certain of my colleagues and friends who are authorities in the special field treated therein. While these gentlemen are in no way responsible for the material of any chapter they have added greatly to the value of the whole by their suggestions and comments. Thus I am indebted to Professor Leon J. Cole for reading the entire manuscript; to Professors A. S. Pearse and F. C. Sharp for reading Chapter VII*; to Professor C. R. Bardeen for reading special parts; to Doctor J. S. Evans for reading Chapter VI

*Chapter numbers in this preface refer to first edition only.

and part of V; to Doctor W. F. Lorenz, of the Mendota Hospital, for reading Chapter VIII; to Judge E. Ray Stevens for reading Chapter IX, and to Helen M. Guyer for several readings of the entire manuscript.

Grateful acknowledgment is made to all of these readers, to various publishers and periodicals for the use of certain of the illustrations, to the authors of the numerous books and papers from which much of the material in such a work as this must necessarily be selected, and to my artist, Miss H. J. Wakeman, for her painstaking endeavors to make her work conform to my ideas of what each diagram should show.

M. F. G.

PREFACE TO THE SECOND EDITION

Eleven years have elapsed since the first edition of this book was published. In the meantime knowledge in the field of genetics has advanced with such rapidity that a thorough revision and expansion of the entire book has become imperative. The wide and friendly interest shown by the public in the first edition has encouraged me in the belief that a further elucidation of some of the questions and the introduction of much new material will be welcomed. The sections on the physical basis of inheritance and on genetics proper have been greatly extended and separate chapters on embryology, the mechanics of development, immigration and population have been added. Numerous additions have been made to the chapter on human inheritance. Although some of the new material is more technical than most of that in the first edition, I have striven to maintain the same simplicity of presentation there employed, so that those with no previous knowledge of biology may continue to read it without undue difficulty.

I am indebted to Professor Royal H. Brink for a careful scrutiny of the material on biometry, to Professor Frederick L. Hisaw, that on embryology, and to Helen M. Guyer for critical reading of the entire manuscript. Grateful acknowledgment is also made to various publishers, periodicals and authors for the use of certain illustrations and much material.

M. F. G.

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CHAPTER I

HEREDITY

"My gifts have come to me from down the years:
I am the son of huntsmen of old time,
The heir of timid virtue and of crime,
Offspring of sluggards and of pioneers,
Inheritor of juggled hopes and fears.
Some gave me purity, some gave the grime
Of damaged souls. Some of them helped me climb
Toward God. From some came smiles, from others tears."
—BARKER.

It is a commonplace fact that offspring tend to resemble their parents. So commonplace, indeed, that few stop to wonder at it. No one misunderstands us when we say that such and such a young man is "a chip off the old block," for that is simply an emphatic way of stating that he resembles one or the other of his parents. The same is true of such familiar expressions as "what's bred in the bone," "blood will tell," and kindred phrases. All are but recognitions of the fact that offspring exhibit various characteristics similar to those of their progenitors.

Blood Heritage.—To this phenomenon of resemblance in successive generations based on ancestry, the term heredity is applied. In man, for instance, there is a marked tendency toward the reappearance in offspring of structures, habits, features, and even personal mannerisms, minute physical defects, and intimate mental peculiarities like those of parents or more remote forebears. These personal characteristics based on descent from a common source are what we may call the blood or, more accurately, the biological heritage of the child to discriminate it from a wholly different kind of inheritance, namely, the passing on from one generation to the next of such material things as per-

sonal property or real estate. The science concerned with heredity and the origin of individuals, or of new types of individuals, is called *genetics*.

Kind Determined by Origin.—It is inheritance in the sense of community of origin that determines whether a particular living creature shall be man, beast, bird, fish, or what not. A given individual is human because his ancestors were human. In addition to this supply of human qualities he has certain well-marked features which we recognize as characteristics of race. That is, if he is of Anglo-Saxon or Italian or Mongolian parentage, naturally his various qualities will be Anglo-Saxon, Italian, or Mongolian. Still further, he has many distinctive features of mind and body that we recognize as family traits, and lastly, his personal characteristics such as designate him to us as Tom, Harry, or James must be added. The latter would include such minutiæ as size and shape of ears, nose or hands; complexion; perhaps even certain defects; voice; color of eyes; and many other particulars. Although we designate these manifold items as individual, they are in reality largely more or less duplicates of similar features that occur in one or the other of his progenitors, features which he would not have in their existing form but for the hereditary relation between him and them.

"Oh Damsel Dorothy! Dorothy Q.!
Strange is the gift that I owe to you;
. . . . . .
What if a hundred years ago
Those close-shut lips had answered 'No,'
. . . . . .
Should I be I, or would it be
One-tenth another, to nine-tenths me!"

"Soft is the breath of a maiden's yes;
Not the light gossamer stirs with less;
But never a cable that holds so fast
Through all the battles of wave and blast,
And never an echo of speech or song
That lives in the babbling air so long!
There were tones in the voice that whispered then
You may hear to-day in a hundred men."

When life steps into the world of matter there comes with it a sort of physical immortality, so to speak; not of the individual, it is true, but of the race. The important thing to note, however, is that the race is made up, not of a succession of wholly unrelated forms, but a continuation of the same kind of living organisms, and this sameness is due to the actual physical descent of each new individual from a predecessor. In other words, any living thing is the kind of organism it is in virtue of its hereditary relation to its ancestors.

It is part of the biologist's task to seek a material basis, a continuity of actual substance, for this continuity of life and form between an organism and its offspring. Moreover, inasmuch as the offspring is never precisely similar to its progenitors he must determine also what qualities are susceptible of transmission and in what measure.

Ancestry a Network.—From the fact that each child has all of the ancestors of its mother as well as of its father, arises the great complications which are met with in determining the lineage of an individual. A person has two parents, four grandparents, eight great grandparents, and thus following out pedigree it is plain to be seen that through this process of doubling in each generation, in the course of a few centuries one's ancestry is apparently enormous. By actual computation, according to Professor D. S. Jordan, if we count thirty generations back to the Norman invasion of England in 1066, at this ratio of duplication, the child of to-day would have had at that time an ancestry of 8,598,094,592 persons. But we know that the total number of inhabitants in the whole world—much less in England—has never been more than a fraction of this enormous aggregate. This means that we shall have to modify our inference that a child has twice as many ancestors as its parents; a condition which at first sight seems evident, but which is not literally true. The fact is that the parents of the child, in all probability, have many ancestors in common—a state of affairs which is brought about through the intermarriage of relatives, and this is especially frequent among remoter descendants of common progenitors. Time after time in genealogy strains of blood have crossed and recrossed, thus reducing the theoretical number of ancestors. Professor Jordan thinks it not improbable that a man of to-day who is of English origin has blood in his veins from practically every inhabitant of England who

lived during the time of William the Conqueror and who left fruitful descendants; and Professor C. B. Davenport concludes that at the present time all people of English descent are related to within the degree of thirtieth cousins, at least, and that most of them are even more closely related. Some genealogists are inclined to doubt this, however, on the ground that because of the tendency toward selective or assortative mating certain strains have not intermingled extensively with others. Instead of conceiving of ancestry as an ever branching and widening tree-like system as it recedes into the past, it is more accurate, then, to regard it in the light of an elaborate meshwork. The "family tree" in reality becomes the family net.

Ancestry in Royalty.—The pedigrees of royal families have proved to be of much importance in the study of human inheritance, not that royal traits are any more heritable than any other, but simply because the records have been carefully kept so that they are the most comprehensive and easily followed pedigrees available. The net-like weave of ancestry is particularly well exemplified in some of these families because of much close intermarriage. Their heritage typifies on an intensified scale the heritage of the mass of mankind. For example, if we go six generations back in the ancestry of Frederick the Great, instead of the expected 64 individual ancestors we find only forty; or in a still more closely-woven stock, in the Spanish royal line of Don Carlos we find in six generations instead of 64 individual ancestors, only 28. If no individual appeared more than once in his ancestry, the present Prince of Wales would have had 4,096 separate ancestors in the twelfth generation back, but according to a recent study made by Mrs. O. A. Merritt Hawkes, 2,997 persons appear more than once, there are 766 unknown ancestors, and only 333 who are known not to have appeared before.

Offspring Derived from One Parent Only.—So far in our reckoning of heredity we have counted elements from father and from mother, and the complications which arise from such a double ancestry are manifestly very perplexing ones. If we could do away with one sex and find offspring that are derived from one parent only, it would seemingly simplify our problem very much for we should thus have a direct line of descent, free from intermingling. This, in fact, occurs to a greater or less extent in a number of instances among lower animals. There