YOU *and* HEREDITY

by

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assisted in the genetic sections by

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ILLUSTRATED BY THE AUTHOR
With four color-plates and seventy-five drawings, maps and diagrams

Including an original study of The Inheritance of Musical Talent

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To

MY FATHER

AND

THE MEMORY OF

MY MOTHER

PREFACE

Most books on scientific subjects addressed to the general public are written from the *inside looking out*—that is to say, from the viewpoint of the scientist looking out, and not infrequently down, to the reader.

This book is written from the *outside looking in*—from the viewpoint of a layman peering into the laboratories of the scientists (in this case those concerned with the study of human heredity) and reporting back to others what he has seen, heard and learned.

The two viewpoints differ in many respects, and especially is this true of the subject here dealt with. The scientist studying heredity is preoccupied chiefly with the *processes* by which the findings in his field were achieved and which pave the way for future discoveries. When, and if, he stops to consider the practical aspects of his science in relation to human life, he is inclined to think in terms of broad averages, of large masses and many generations, and of individuals as mere fragments in a limitless mosaic.

But the layman is interested primarily in himself and in the immediate application of the scientific findings to his own life and to his own little world which will come to an end when he passes on.

The difference in viewpoints underlies the motivation and, I hope, the justification for this book. Had any scientist made easily available to me all the facts about human heredity which I wished to know, and which many years of writing for the general public have taught me that others wish to know, this book would never have been written, nor should I have had the temerity to think of writing it. When I began my study of the subject, it was solely with the practical purpose of utilizing some facts about human heredity in a projected work of fiction. Before very long I discovered that the findings in this field so completely shattered my own preconceived notions and the ideas held by all but an initiated few, as to obliterate my original plans. I became convinced that the most in-

teresting and important task before me was to acquire as thorough a knowledge of this subject as I could and then, in some way, to communicate what I had learned to others.

The subsequent steps included my enrolment (at a mature age) for a college course in genetics and the setting aside of all other activity for several years to devote myself to further study and research. The first fruits came with a series of articles on human heredity which I wrote for a popular magazine. These proved to my own satisfaction that the subject could be expounded to laymen without putting them through the technical mazes of meiosis and mitosis, the formation of spindle fibers and polar bodies, of linkage, cross-over, nondisjunction of chromosomes, tetraploidy, etc., all considered essentials in almost every college course and treatise on genetics.

From the articles grew the plan for a book, but even when the contract for it was signed with my publishers, nothing like the present work was contemplated. That it did grow to its present proportions was due to many factors, not the least of which was the quite unexpected aid and encouragement given it by the very scientists and other authorities who, I had feared, would look askance at such a project undertaken by one outside their fold.

Thus, well aware that a layman writing on a scientific subject must, like Caesar's wife, be—or try to be—above suspicion, I am heartened by the thought that in every phase of this book I have had expert counsel and guidance, and that, as a happy consequence, my acknowledgments of indebtedness are many.

In my toddling steps I was aided by Dr. Henry J. Fry of the New School For Social Research. Later, as the necessity for an active scientific associate grew imperative, through the friendly offices of Prof. Donald C. Lancefield, then of Columbia University and now of Queens College, I was brought in touch with Dr. Morton D. Schweitzer of the Cornell University Medical College.

Dr. Schweitzer's participation in this enterprise proved one of the happiest events that could have befallen it. To him fell the task of gathering most of the material for the chapters dealing with hereditary diseases and defects, and of preparing the data for the extensive "black" gene lists; of working out genetic ratios for the

various "forecast" tables and other parts involving genetic predictions; and in general, of casting a trained eye over all the facts and statements in the book coming within the scope of his knowledge as a geneticist. I can say unreservedly that without his enthusiastic cooperation, painstaking research and meticulous editing, this book would have fallen short of such scientific validity as it may now possess.

Because human genetics is correlated with all other sciences dealing with human beings, it was necessary to seek further for information and counsel from physicians, sociologists, psychologists, anthropologists and various other experts. This aid was so graciously and generously given wherever sought that every part of this book can be said to have had the benefit in its preparation of careful reading, discussion, criticism or editing by some qualified expert. With both pride and gratitude I therefore acknowledge my great indebtedness to the following:

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(In all of these acknowledgments no responsibility is implied on the part of the individuals named for any errors of fact or judgment that may still have survived in the text. The responsibility for any failings of commission or omission, or for any opinions expressed in this book, I accept fully as my own.)

On behalf of Dr. Schweitzer, as well as on my behalf, thanks are extended to the following who discussed with him special phases of disease inheritance: Dr. James Ewing, Director of the Memorial Hospital for the Treatment of Cancer; Dr. May Wilson, Associate Professor of Pediatrics at Cornell University Medical College (childhood rheumatism); Dr. Eugene Opie, Professor of Pathology at Cornell (tuberculosis); and also to Drs. William Schmidt, Harold Aaron, Emanuel Klein, Nathan Kaliss and Emil Smith.

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Special thanks, which I am sure will be echoed by all music lovers, are due to the scores of musicians and singers who contributed data for the study of the Inheritance of Musical Talent, to their concert managements and personal representatives who aided in enlisting their cooperation, and to Ernest Hutcheson, President of the Juilliard Institute; also, for the auxiliary study of Voice Types, to Miss Rose Held and members of the Schola Cantorum.

To Prof. Gregory G. Pincus and to the Anatomical Record I am indebted for permission to reproduce the photograph of the human ovum; to Dr. Seymour F. Wilhelm, of Beth Israel and Montefiore Hospitals, New York City, for the slide from which the spermatozoa photograph was made; to Prof. Lewis M. Terman of Stanford University and to the McGraw-Hill Company, for permission to

use material from "Sex and Personality"; and to the Macmillan Company for permission to quote from "Human Heredity," by Baur, Fischer and Lenz.

My memory has undoubtedly failed me with regard to others who have been of great help. Also, while I do not name them, members of my family and many friends know how deep is my gratitude for innumerable services and considerate acts which contributed toward the production of this book.

Finally, I wish to acknowledge my debt to all the many geneticists, scientists and research workers from whose painstaking studies I have gleaned, and in the conveyance of whose findings my rôle has been merely that of a reporter. It is my hope that the indebtedness will be repaid in some measure by such added interest as this book may stimulate in their work.

To acknowledge my great debt to my publishers would be superfluous, for the make-up of this book itself will speak for their faith in this enterprise and the unlimited support and encouragement which they gave it.

AMRAM SCHEINFELD

New York City,
June 1, 1939.

YOU AND HEREDITY

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CHAPTER I

A NEW SCIENCE

Stop and think about yourself:

In all the history of the world there was never any one else exactly like you, and in all the infinity of time to come there will never be another.

Whether or not you attach any importance to that fact, undoubtedly you have often wondered what made you what you are; what it was that you got from your parents and your ancestors and how much of you resulted from your own efforts or the effects of environment; and finally, what of yourself you could pass on to your children.

Until comparatively recently, all this was a matter of theory and speculation. Not until the dawn of this century was anything definitely established about the mechanism of heredity, and for some years thereafter the most important points were bandied about like footballs among the biologists. Then, dramatically climaxing a series of some of the most remarkable experiments in all scientific history, the whole field of genetics (the study of heredity and variation among living things) became brilliantly illumined, and what had been theory became fact.

With American geneticists, led by the Nobel Prize winner, Thomas Hunt Morgan, in the vanguard, the work has been proceeding on many broad fronts throughout the world. New data are pouring in with increasing volume from geneticists, pathologists, and other scientists. Experiments are repeated countless times, statements checked and rechecked. If the reader is inclined to be skeptical regarding some of the conclusions, let him be advised that no greater skeptics can be found than the geneticists themselves. Their rigid determination to take nothing for granted, and to subject the reports of even their most brilliant colleagues to the

severest tests, has made genetics one of the most exact of all biological sciences.

Thus it can be said with assurance that the mechanism of heredity—among humans as among other living and growing things—now stands clearly revealed. While all of its intricacies are by no means laid bare, the basic principles are as unmistakably clear as the workings of a watch. Problems of heredity that confounded the greatest thinkers and scientists of the past, from Aristotle to Darwin, have been solved. Long-standing mysteries about birth and development have been unraveled. Endless popular beliefs, theories and superstitions have been completely discredited. Existing social philosophies have been called into question and the way pointed to a reconstruction of humanity itself.

And yet, vitally important as all this is, very little of it has so far seeped through to the general public. If nobody believes in the stork any more, it is astonishing what people still do believe about heredity. The fault, however, is not that of the layman. Developments in the field of genetics have been too rapid and recent to reach widespread circulation, and most of the published reports have been of so technical a nature as to have little appeal for the average reader. Even where isolated phases of the subject are popularly treated in newspapers and magazines, the layman is generally left confused through lack of sufficient understanding of the basic principles.

So we come to the purpose of this book, which is:

1. To sift out from the genetics laboratories and research fields the outstanding facts about heredity directly applicable to human beings.

2. To present these facts in clear-cut, untechnical language, diagrams and illustrations.

3. To point out what their significance may be to the individual and to society, leaving the reader to draw his own conclusions.

The steps and processes by which these findings were arrived at will be largely omitted. It is assumed that you, the reader, do not care two raps about the love life of sea urchins or about the interaction of hereditary factors for coat colors in mice, or what happens when a yellow-bodied *Drosophila melanogaster* (fruit-fly) with

double-bar eyes and vestigial wings is crossed with a gray-bodied, long-winged, normal red-eyed one. True, without laborious study of these lowlier creatures the geneticists could never have arrived at the facts about human beings, for not the least of their amazing discoveries has been that the mechanism of heredity is almost the same in all living things.

Nevertheless, the facts about the laboratory creatures can wait. What you probably wish to know, as directly as possible, are the answers to the innumerable questions about your own heredity and that of your fellow humans. These questions we hope have been anticipated and answered in the following pages.

The fact has not been overlooked that many readers may already know more or less about the subject of heredity; but for the sake of the many others to whom this is all quite new, it is our plan to presuppose no previous knowledge whatsoever. And so, in the vernacular, we are going to start from "scratch."