

ELEMENTS OF GENETICS

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GENETICS

MENDEL'S LAWS OF HEREDITY WITH SPECIAL APPLICATION TO MAN

By
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Second Edition



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SECOND EDITION
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To My Mother

PREFACE TO SECOND EDITION

AMONG the reasons for presenting a revised edition of this book, the following are of chief importance. During the past five years investigators in genetics have discovered new principles and made new applications of established laws. An up-to-date textbook should include the most significant of these advances. The writer's experience as well as the suggestions of other users of the book have shown the desirability of broadening the discussion of certain topics, of adding new illustrative material, and of making a few changes in the sequence of subject matter. However, the original plan and purpose of the book as a beginning text in genetics, as outlined in the Preface to the First Edition, have met with favor and are retained. The principal additions and changes will be mentioned briefly.

The treatment of probability has been strengthened by a description in Chapters 2 and 3 of the application of the binomial theorem and of the Chi Square Test to problems in genetics. The chapter on Linkage and Crossing-over has been clarified by the addition of new illustrations and examples. An exchange in position has been made between this chapter and that on the Factor Principle, so that Linkage (one of the most difficult principles for students) now comes later in the book. New illustrations and examples of the Factor Principle have been added.

A number of changes have been made in the chapters on Heredity in Man, where the most important new material relates to differences in human blood. The discussion of the major blood groups has been brought up to date by the inclusion of the subgroups of groups A and AB. Newly added is the description of the M-N Types and the recently discovered Rh blood factor. The subjects of Sex Determination, Sex Differentiation, and Sex Linkage have been thoroughly revised. Among the additions to these chapters are several new and original illustrations.

The chapter on Heredity and Environment has been improved by the introduction of several new examples and original figures.

The discussion of the Gene and Mutation has been revised in the light of some of the recent significant work on the nature and physiology of viruses and their relation to genes. Under the head of Chromosome Changes, polyploids receive increased attention in line with their established importance in the origin of new types of plants. There is a brief discussion of the Position Effect. New illustrations and examples add much to the interest and effectiveness of the chapter on Inbreeding and Crossbreeding. The chapter on Heredity and Evolution has been critically revised and notice taken of recent research on population genetics.

To the reader, perhaps the most noticeable change in the book as a whole will be the many new and attractive illustrations. The number of illustrations has been practically doubled in this edition; each one has been carefully selected to illuminate some particular point and thus to facilitate its understanding and retention by the student. The lists of problems have been revised, and new problems added for most of the chapters. It is hoped that this revised edition will merit the same generous and favorable response accorded the first.

I wish to thank both authors and publishers for their permission to reproduce illustrations from their various publications; full credit for all borrowed figures is given in the legends thereto. I am indebted to Prof. R. A. Fisher, also to Messrs. Oliver and Boyd, Ltd., of Edinburgh, for permission to reprint Table No. 2 from their book, "Statistical Methods for Research Workers." I am greatly indebted to Professor Sewall Wright for checking Fig. 77. My thanks are due to my son Edward for making the drawings for the new figures and to my son Galen for typing the new material in the book. To the efficient staff of The Blakiston Company I acknowledge sincere thanks for their part of the job of seeing the book through the press.

The author assumes full responsibility for all text material, and he will be grateful as in the past to readers who may suggest, either to him or to the publisher, changes or inclusions which they deem necessary.

E. C. C.

PREFACE TO FIRST EDITION

THIS BOOK is designed especially for college students in genetics. It is the outgrowth of study on the part of the writer in connection with teaching the subject over a considerable period of years. Although written primarily for use as a text and reference work it is hoped that the large amount of material on man will make it of interest and value to the general reader.

The aim has been to present a clear and readable account of the elements of the science of genetics, with special emphasis upon the applications to man. In addition to a full explanation of the classic laws of Mendel and of the supplementary principles of heredity discovered since Mendel's time there is included a thorough discussion of the rôles of heredity and environment in the development of the individual.

The historical approach has been adopted as the one most likely to gain the interest of the reader. Numerous historical references are included in each chapter: it is felt that a knowledge of the development of a science is of particular interest and importance to the beginning student. A separate chapter on the rediscovery of Mendel's work has been introduced because of the human interest and cultural value of the facts surrounding this episode. Similar reasons have prompted the inclusion of two rather long chapters on the heredity of human traits.

There is as yet no standardized order for the treatment of topics in genetics. The present arrangement has been found logical and workable in college classes; various shifts in the sequence of chapters are possible, however, without sacrificing the unity and coherence of the discussion as a whole.

Special care has been taken to select attractive and appropriate figures and to integrate these with the body of the text. The problems at the ends of the chapters have been tried out with numerous students. They represent considerable range in difficulty; in general the easier problems are placed at the head of the

list and the more difficult ones near the end. Since good definitions of terms used in genetics are not always easy to find, a *Glossary* has been appended.

I am deeply indebted to Professor Sewall Wright for reading the entire manuscript and for making valuable suggestions. Special thanks are due to my wife, Alta R. Colin, who made some of the drawings and read the text at several stages in its development, giving much assistance in the clarification of the language. Most of the drawings are the work of Virgil Vogel, to whom I express my sincere appreciation. It is with pleasure that I record my gratitude to The Blakiston Company, Publishers, and to their highly efficient editorial and advisory staff. Finally, I wish to thank the numerous authors and publishers who have generously granted permission to use copyrighted figures and quotations from their various publications. Individual credit is given to each author and publisher in the appropriate place in the text.

In spite of all efforts to eliminate errors it is realized that these may still exist. For any errors that may be found the author is entirely responsible and he will be grateful to anyone who will be kind enough to call them to his attention.

E. C. C.

CHICAGO, ILLINOIS.
February, 1941

CONTENTS

Chapter 1

- ✓ MENDEL: STUDENT, PRIEST, TEACHER, INVESTIGATOR 1
- X Mendel as Teacher—Mendel as Investigator—Mendel and Evolution—Mendel's Experiments with Peas—Reasons for Mendel's Success.

Chapter 2

- ✓ DOMINANCE AND THE LAW OF SEGREGATION 11
- ✓ Round Peas and Wrinkled Peas—Other Characters Follow the Same Law—Later Generations of Hybrids—Mendel's Determiners: Chromosomes and Genes—The Law of Probability—Albinism, a Mendelian Trait in Man—Lack of Dominance.

Chapter 3

- ✓ DIHYBRIDS: THE LAW OF INDEPENDENT ASSORTMENT 33
- A Dihybrid Mating—Lack of Dominance in Dihybrids—Trihybrids Show Independent Assortment—Back-crossing Dihybrids—Testing the Closeness of Fit of an Observed Ratio.

Chapter 4

- ✓ CHROMOSOMES AND MENDEL'S LAWS 48
- Mitosis—Meiosis—Chromosomes and Independent Assortment.

Chapter 5

- ✓ THE FACTOR PRINCIPLE: ACTION AND INTERACTION OF GENES 69
- Color in Sweet Peas—Mendel's Case in Beans—The Factor Principle Applied to Man—The Factor Principle in Guinea Pigs—Multiple Alleles—Multiple Effects of a Single Gene.

Chapter 6

- ✓ THE REDISCOVERY OF MENDEL'S WORK. 93
 "Botanical Mathematics"—Nageli and Mendel—Resurrection
 of Mendel's Paper—Iltis' Tribute to Mendel.

Chapter 7

- ✓ LINKAGE AND CROSSING-OVER. 105
 Linkage and Crossing-over in *Drosophila*—Explanation of
 Crossing-over—Mapping Chromosomes—Linkage in Other
 Species—Summary.

Chapter 8

- HEREDITY IN MAN. I 123
 Skin, Hair, Nails, Teeth—Eyes—Skeleton and Muscles.

Chapter 9

- HEREDITY IN MAN. II. 164
 Circulatory and Respiratory Systems—Excretory System—
 Endocrine Glands—Digestive System—Reproductive System
 —Cancers and Other Malignant Tumors—Nervous System—
 Special Talents.

Chapter 10

- SEX DETERMINATION AND SEX DIFFERENTIATION 205
 Chromosomes and Sex Determination—Sex-ratio in Man and
 Animals—Twins: Cause and Sex-ratio—"Siamese" Twins
 and "Double Monsters"—Heredity of Twinning in Man—Sex
 Differentiation—Parthenogenesis.

Chapter 11

- SEX-LINKED HEREDITY 234
 ✓ Color Blindness—Other Sex-linked Characteristics in Man—
 Y Chromosome Inheritance.

Chapter 12

- HEREDITY AND ENVIRONMENT 251
 Genes Inherited Rather Than Characteristics—Identical Twins
 and Fraternal Twins—Physical Observations and Measure-
 ments—Tests—Identical Twins Reared Apart—Age of Mother
 a Factor in Mammals—Are Acquired Characteristics
 Inherited?—"Mental Impressions" (*Maternal Impressions*).

Contents

xiii

Chapter 13

THE GENE AND MUTATION 284
The Nature of the Gene—Causes of Mutations—The Control of Mutations—Chromosome Changes—Chromosome Rearrangements: Locating the Gene—The Physiology of the Gene.

Chapter 14

INBREEDING AND CROSSBREEDING. 316
Effects of Self-fertilization—Brother-sister Matings in Guinea Pigs—Hybrid Vigor—Marriage Laws Prevent Close Inbreeding in Man—Cousin Marriages and Defectives in Man.

Chapter 15

✓ HEREDITY AND EVOLUTION 339
Mendel and Evolution—Natural Selection—Sexual Selection—Isolation as a Factor in Evolution—The Origin of Non-adaptive Differences—Hybridization and the Origin of Species—Accelerating Factors in Evolution—Conclusion.

Chapter 16

IMPROVEMENT OF THE HUMAN SPECIES (EUGENICS) 365
Ideals—Methods of Improving Mankind—Conclusion.

GLOSSARY 379

INDEX 389

INDEX

Page numbers in bold face type indicate illustrations

A

Achondroplasia, 152, 153
Acquired characters, 278-281, 284, 291, 340
Adaptation, man, 365-367
Adolescence, 224
Age, of earth, 360
 of father, 272
 of mother, effect, in mammals, 272-278
 in man, 275-278
 on twinning, 223
Agouti, 76, 83
Ainus, 137, 172
Albinism, in animals, 25, 45, 83, 84
 in corn, 252, 253, 254
 in man, 24, 25, 26, 29, 146, 372
 in Negro-white crosses, 146
Albucasis, 243
Alcohol, 295-299
Alleles, defined, 81
 multiple, 81-85, 166
Allelomorph, 81
Allergy, 176
Alpine race, 155
Amaurotic idiocy, 193, 334-336
Amphibia, polyploids, 305
Anaphase, 49, 50, 51
Anasa tristis, 206, 207
Anderson, E., 136
Anther, 8
Antirrhinum, 361
Aphids, 228
Arey, L. B., 57, 219, 225
Armadillo, 217, 218
Artemia, 305
Artificial parthenogenesis, 231, 232
Artistic ability, 199-201
Ass, 326

Aster, 51
Astigmatism, 150
Atavism, 72
Ateliosis, 153, 154, 155
Auditory nerve atrophy, 189
Australians, 139, 155, 170, 172
Avery, A. G., 301

B

Bach family, 200
Back-cross, crop improvement, 17
 Drosophila, 17, 18, 107-110
 guinea pigs, 19, 19-22
 in dihybrids, 41, 42
Bailey, L. H., 97
Baldness, 139
Bamford, R., 302
Bateson, W., allelomorphs, 81
 linkage and crossing-over, 105
 memorial to Mendel, 102
 sweet peas, 69-72
Bauer, Julius, 181, 186
Baur, Erwin, 154, 361
Beadle, G. W., 252
Beans, 72
Beard, 137
Bees, 229, 230, 231
Benedict, F. G., 361
Berbers, 146
Berger, C. A., 310
Bernoulli family, 202
Binomial theorem, 23
 "Biological Effects of Radiations," 293
 Biology of the Negro, "The, 177
Birch, C. L., 243
Birds, plumage, 350
 sex determination, 211
 songs, 350

Birth, control, in Japan, 344
 in Norway, 258
 in United States, 345
 injuries, 193
 Blakeslee, A. F., 188, 301
 Bleeder's disease, 243-246
 Bleuler, E., 194
 Blondes, 132
 Blood, groups, man, 164-171
 rabbits, 82
 pressure, 176
 types, 171-174
 "Blood Groups and Transfusion," 169
 Blossom, 7, 8
 Bones, brittle, 88
 Boveri, Theodor, 183
 Brachycephaly, 155
 Brachydactyly, 157, 158, 159
 Brain, atrophy of, 30
 size and intelligence, 193
 Brassica, 356
 Breast cancer, 184
 Bridges, C. B., 106, 307, 310
 Bridges, P. N., 311
 Briggs, F. N., 18
 Briggs, H. H., 149
 Brittle bones, 88
 Brother-sister matings in guinea pigs,
 320-326, 328
 Brünn Society for the Study of Natural
 Science, 6, 93
 Buchanan, A. C., 331

G

Cabbage-radish hybrids, 355-358
 Cancer, 182-186
 Carcinoma, 182
 Castle, W. E., 81, 119, 152, 274
 Castration, 224, 369
 Cataract, 150
 Cats, color inheritance, 46
 Siamese, 256, 257
 tailless (Manx), 46
 white, blue-eyed, deaf, 354
 Cattle, colors and horns, 37, 38, 39
 intersexes, 226, 227
 twins, 226, 227
 Caucasoids, 137, 155, 170, 187

Caulfield, E. J., 180
Cavia cutleri, 76
 Cell in Development and Heredity," "The.
 62, 206
 Central body, 50, 51
 Centrifuging, 301
 Centromere, 50, 51, 55, 56
 and crossing-over, 117
 Cerebral hernia in fowls, 87, 88
 Characters, adaptive, 341-351
 nonadaptive, 171, 172, 187, 285, 353-
 355
 Charlemont, Theodor, 103
 Chi Square Test, 42-45
 Chiasma, 55, 56, 113
 Chickens, 85, 86, 87, 88
 China, marriage laws, 332
 Chinese, 173, 188, 238
 Chlorophyll, 252
 Chorea, 191
 Chromatids, 50, 51, 55, 56, 113
 and crossing-over, 112, 113, 114
 Chromatin, 50, 51, 301, 310
 Chromomere, 55, 113
 Chromosome changes, 285, 293, 300-
 311, 315
 Chromosomes, cabbage, 356
 chrysanthemums, 302
 discovery of, 16, 48
 Drosophila, 209, 307, 309
 grasshoppers, 52, 58, 206
 human, 210
 independent assortment, 59-67
 mapping of, 114-117
 Mendel's laws, 16, 17, 48-68
 numbers in plants and animals, 52, 62,
 113, 302
 origin of, 311
 radish, 356
 salivary glands, 306-311
 sex determination, 205-211
 squash bug, 207
 staining capacity of, 48
 table of, 62
 whitefish, 49
 Chromosomes in Man, Sex and Somatic,"
 "The, 210
 Chrysanthemums, 302
 Circumcision, 243

- Clausen, Jens, 304
 Cleft palate, 160
 Cockayne, E. A., absence of sweat glands, 242
 achondroplasia, 154
 allergy, 176
 baldness, 139
 edema, 175
 freckles, 134
 hair form, 28
 hairlessness, 138
 ichthyosis hystrix gravior, 246, 247
 "Inherited Abnormalities of the Skin and Its Appendages," 28, 126
 neurofibromatosis, 185
 piebald, 129
 red hair, 132
 skin defects, 141
 telangiectases, 174
 tooth defects, 142
 xeroderma pigmentosum, 184
 Coin flipping, 19, 20
 Colchicine, 300
 Colin, E. C., 298
 Color, beans, 72
 blindness, 234-241
 environmental effects, 256, 257
 guinea pigs, 75-85
 hair, cattle, 37, 38, 39
 man, 74, 126-134
 sweet peas, 69-72
 Congenital deafness, 189
 Corn, albinism, 252, 253
 color gene, 72
 hybrids, 330
 inbreeding, 331
 linkage, 118, 119
 position effect, 315
 starch grains, 314
 tetraploid, 304
 Correns, Carl, 99
 Cosmic rays, 294
 Cousin marriages, 194, 331-337
 albinism, 24, 25, 372
 Cowper, William, 197
 Crane, M. B., 113, 359
 Creation, 339
 "Crest" in fowls, 85, 86, 87, 88
 Cretin, 152, 153
 Crew, F. A. E., 212
 Crime, 260
 "Crime and Destiny," 260
 Criminal, behavior, 261
 laws, 368
 Criss-cross inheritance, 236
 Crocker, William, 330
 Crossbreeding, 316-338
 Crossing-over, 105-122
 defined, 105
 Drosophila, 108, 109
 explanation of, 112-114
 significance of, 121
 Crossovers (recombinations), defined, 105
 double, 115
 Cyclopia, 326
Cynips kollari, 229
- D**
- Dachshund, 154
 Dafoe, A. R., 220
 Dandruff, 139
 Danforth, C. H., 138, 163
 Darbshire, A. B., 313
 Darlington, C. D., 9, 52
 Darwin, Charles Galton, 94
 Darwin, Charles R., age of earth, 360
 and Mendel, 4, 5, 340, 341
 crest in fowls, 85, 86, 87
 family pedigree, 337
 hypothesis of pangenesis, 279
 ideas on heredity, 4, 5
 inheritance of acquired characters, 279
 natural selection, 286, 341-351
 nonadaptive differences, 354
 origin of life, 339
 portrait, 341
 "The Origin of Species," 4, 5, 286, 339
 "The Variation of Animals and Plants Under Domestication," 85
 Davenport, C. B., 74
 Day blindness, 235
 Deafness, man, 188
 Defectives, cousin marriages, 334-337
 inbreeding, 326
 Dementia praecox, 194-197
 Demerec, M., 361

- Dentin defect, 142
 Dermen, Haig, 301
 "Determiners," 13-17, 72
 De Vries, Hugo, 98, 284
 Diabetes insipidus, 179
 Diabetes mellitus, 180
 Dice throwing, 20
 Diehl, Karl, 178
 Digestive system, 180, 181
 Digit anomalies, 156-160, 247, 250
 Dihybrids, 34-42
 Dionne quintuplets, 220
 Diploids, 301
 Diptera, 311
 Disease resistance, man, 176, 177
 plants, 17
 Dobzhansky, T., 89, 342, 358
 Dogs, Chihauhuan, 139
 dwarfism, 154
 white spotting, 127
 Dolichocephaly, 155
 Domesticated plants, cabbage-radish,
 355-358
 chromosome numbers, 302
 corn (see corn)
 evolution of, 340
 peas (see peas)
 radish, 355
 sugar cane, 330
 tomatoes, 301
 wheat, 302
 Dominance, defined, 12, 28
 lack of, in dihybrids, 37-40
 in monohybrids, 26-29
 in multiple alleles, 82-84
 not a universal law, 27
 theories of, 14, 28
 Dorsey, M. J., 95
 Down, J. L., 275
 Drawing, painting, sculpture, 201
 Dropsy, 175
 Drosophila, back-cross in, 17, 18, 107-
 110
 black, 107, 108, 109
 chromosomes, 111, 209, 307, 309
 intersexes, 228
 lead poisoning, 299
 linkage and crossing-over, 107-117
 multiple effects of gene, 89
 Drosophila—(Continued)
 mutations, 44-45, 89, 107-112, 228,
 294
 and x-rays, 292
 rate of, 361
 salivary gland chromosomes, 307, 309
 sex chromosomes, 208, 209
 vestigial wing, 17, 18, 108, 109
 Duggar, B. M., 293
 Dupertuis, C. W., 155
 Durham, F. M., 297
 Dwarfism, 152-155
- E**
- Ear lobes; 143, 144
 Earth, age of, 360
 East, E. M., 197
 Eaton, O. N., 228, 320
 Ectoderm, 133
 Edema, 176
 Education, 374
 Egg, animals, 55
 human, 57
 plants, 8, 13
 Eggs of Mammals," "The, 231
 Elephant, 361
 Embryos, armadillos, 218
 human, 219
 Emerson, A. E., 343
 Emerson, R. A., 252
 "Emma Darwin, A Century of Family
 Letters, 1792-1896," 337
 Endocrine glands, diabetes, 180
 freemartin, 226, 227
 intersexes, 225-228
 stature, 152, 153
 Environment, and evolution, 362
 improvements in, 376
 queen and worker bees, 229, 230
 uterine, 264, 272
 Epileptics, 295
 Equus hybrids, 326
 Erythroblastosis, 173
 Eskimos, blondes, 146
 blood types, 172
 body hair, 137
 hair color, 132
 Estes, J. A., 349

Eugenic Predicament," "The, 373

Eugenics, 365-378

defined, 368

negative, 368-372

positive, 372-376

sterilization, 369

Eunuch, 139, 152, 225

Evans, H. M., 210

Evolution, accelerating factors, 359-362
defined, 329

environmental changes, 362

human, 351, 363

inbreeding as a factor, 362

isolation a factor, 351-353

mutation, 284, 361

natural selection, 341-351

rate of, 360-362

sexual reproduction, 361

sexual selection, 350

Evolution of Genetic Systems," "The, 9

Excretory system, 178

Eye characters, in twins, 265, 271

man, 144-151

retinal glioma, 186

F

Facial features, 265

Factor principle, 69-92

beans, 72

guinea pigs, 75-85

man, 74

Mendel's case, 72

"*Familial Susceptibility to Tuberculosis*,"
178

Family allowances, 373

Fankhauser, G., 305

Farabee, W. C., 158

Farsightedness, 150

Feeble-mindedness, 191-194

Fertilization, cross, 8, 9

defined, 59

discovery, 59

functions, 59

process of, 55, 59

self, 7, 8

Fingernail biting, 271

Fingerprints, 216

Finn, S. B., 142

Fischer, Eugen, 154

Fisher, R. A., 42, 85, 223

Fishes, sex determination, 211

Fitch, Lyle, 129

Fitness, 346

man, 365

racial, 367

Flemming, W., 49

Flower, color, beans, 72

peas, 33, 69

stalk in peas, 27

Flowering time in peas, 27

Focke, W. O., 97, 100

Food, 257-259

Four-o'clock, 9, 29

Fowls, 85, 86, 87, 88

Fox, A. L., 187

Fraser, A. C., 252

Freckles, 134, 184, 185

Freeman, F. N., 262

Freemartin, 226, 227

Friedreich's disease, 190

Friendly Arctic," "The, 132

Frogs, parthenogenesis, 231

G

Gall-fly, 229

Galton, Francis, 201, 202, 368

Gamete, defined, 13

formation of, 54-59

grasshoppers, 206

man, 57

Gates, R. R., 155, 174, 181

Genes, linear order of, 111-115, 289,
306, 310

location of; 306-311

multiple effects, 85-90, 349

nature of, 286-290

number of, 63, 310, 311

physiologic effects, 28, 71, 311-315

purity of, 16-19

relationship to viruses, 286-289

units of heredity, 71, 252

"*Genetics and the Origin of Species*," 89

Genetics of Schizophrenia," "The, 196

Genetics of the Mouse," "The, 161

Genius, and insanity, 197

drawing, painting, 201

mathematical, 201

- Genius—(Continued)
 musical, 200
 sculpture, 201
- Genotype; defined, 36
- Geographical isolation, 351
- Geometrical ratio of increase, 343-345
- Giraffe, 278, 346
- Glaucoma, 151
- Glioma, 186
- Gonads; differentiation, 223
- Gordon, G. R., 179
- Grasshoppers, 52, 58, 206
- Gregory, R. P., 313
- Greulich, W. W., 213
- Grüneberg, H., 161
- Guinea pigs, agouti series of alleles, 83
 albinism, 80
 albino series of alleles, 83-85
 alcohol, 296
 back-cross matings, 19, 19-22
 brother-sister matings, 320-326, 328
 color varieties, 77-85
 extra toes, 273-275
 factor principle, 75-85
 lead poisoning, 298
 multiple alleles, 81-85
 mutations, 76
 origin, 76
 piebald pattern, 77, 273
 resistance to tuberculosis, 177, 323,
 328, 329
 rough fur, 45
 x-rays, 294
- H**
- Hair, body, 137-139
 color, cattle, 37, 38, 39
 environmental effects, 256, 257
 guinea pig, 75-85
 man, 126-133
 form, 28
 woolly, 134
- Hairlessness, 138
- Haldane, J. B. S., 244
- Handwriting, 271
- Handy, L. M., 261
- Haploid, 301
- Harelip, 160
- Health, 365
- Hemophilia, 243-246
 "Hemophilia: Clinical and Genetic Aspects," 243
- Hemorrhoids, 175
- "Hereditary Genius," 201
- "Heredity and Disease," 258
- "Heredity in Man," 155
- Hermaphroditism, human, 225, 228
 plants and animals, 304, 355, 359
- Hernia, 161
 cerebral, 87, 88
- Hertwig, O., 59
- Heterozygote, defined, 13
- Hiesey, W. M., 304
- Himalayan rabbit, 256
- Hirschsprung's disease, 181
- Hodge, H. C., 142
- Hoffmann, H., 97
- Holmes, S. J., 177, 373
- Holz, A. M., 90
- Holzinger, K. J., 262
- Homo sapiens*, 365
- Homosexuality and schizophrenia, 196
- Homozygote, defined, 13
- Honeybee, parthenogenesis, 228-231
- Hooker, J. D., 339
- Hooton, E., 148
- Hormones, in diabetes, 180
 in intersexes, 226, 227, 228
 stature and, 152
- Horns, inheritance of, 37, 38, 39
- Horse, 326, 347, 348, 349
- Hughes, B. O., 147
- Hughes, J. E., 369
 "Human Embryology," 160
 "Human Heredity," 154
- Huntington's chorea, 191
- Hybrid, corn, 330-333
 definitions, 8, 13
 gametes formed by, 13, 14
 génius, 328
 horse and ass, 326
 man and other mammal, 223
 peas, 7
 racial and species, 100, 355
 reversion to type, 15
 sugar cane, 330
 variability in, 4, 356
 vigor, 326-331

Hybridization, 355-359
 Hyperopia, 150
 Hypertension, 176
 Hypertrichosis, 138
 Hypospadias, 182
 Hypothesis of pangenesis, 279
 Hypotrichosis, 138

I

Ichthyosis, 141, 246, 247
 Identical twins, 215, 216, 262-272
 human embryos, 219
 manic-depressive psychoses, 198
 racial differences in frequency, 222
 schizophrenia, 196, 198
 Idiocy, 192-194, 334-336
 Itis, Hugo, 1, 93, 158, 159
 letter from Focke, 97
 tribute to Mendel, 101-104
 Imbecile, 192
 Immigration, 373
 Inbreeding, 316-338
 albinism in man, 24, 25, 26
 Friedreich's disease, 190
 guinea pigs and tuberculosis, 177, 323
 human, 316
 idiocy, 194, 334, 336
 sex-ratio in rats and, 214
 Independent assortment, chromosomes
 and, 59-67
 in guinea pigs, 75-79
 in man, 64-67
 law of, 33-42
 Indians, 137, 170, 172, 188, 238
 Inheritance of acquired characters, 5, 97,
 278-281, 284, 291, 340
 "Inherited Abnormalities of the Skin and
 its Appendages," 28, 126
 Insanity and genius, 197
 Intelligence, adaptive trait, 366
 definition, 192
 racial differences in, 366, 367
 tests, 192
 Intelligence quotient (I.Q.), defined, 192
 of twins, 262-272
 Interference, 116
 Interphase, 50

Intersexes, cattle, 226, 227
 goats, 228
 human, 225, 227
 insects, 228
 Iris, absence of, 30
 color, 145-147
 pattern in twins, 265, 271
 Irish, 133
 Ishihara, S., 235
 Isolation, 351-353

J

Jackson, Deborah, 255
 Jackson, Roscoe B., Memorial Labora-
 tory, 119
 Japan, birth control in, 344
 marriage laws, 332
 population growth, 344
 sex-ratio births, 212
 Japanese, 172, 173, 188
 Jaundice, hemolytic, 174
 Jews, 133, 243
 Jones, D. F., 315
 Jorgensen, C. A., 301

K

Kallmann, F. J., 196
 Keck, D. D., 304
 Keeler, C. E., 82
 Kidney diseases, 178
 Kinetochore, 51
 King, H. D., 214
 Kirkham, W. B., 88
 Kislovsky, D., 138
 Kneberg, Madeline, 134
 Knight, A., 97

L

Lamarck, J. B., 279, 291
 Landsteiner, K., 166, 171, 172
 Lange, J., 260
 Lapps, 151
 Lawrence, W. J. C., 113, 359
 Laws, marriage, 331
 sterilization, 369
 Lead poisoning, 297

Lenz, Fritz, achondroplasia, 153
 alcohol, 295
 allergy, 176
 cancer of stomach, 186
 feeble-mindedness, 193
 hernia, 161
 Hirschsprung's disease, 181
 "Human Heredity," 154
 hypertension, 176
 hypospadias, 182
 manic-depressive psychoses, 198
 paralysis agitans, 191
 retinal glioma, 186
 rickets, 255
 schizophrenia, 195, 295
 skeletal defects, 161
 ulcers, 181

Letard, Etienne, 138

Lethal genes, 88, 244

Levine, P., 171, 173

Levit, S. G., 179

Lewis, J. H., 177

Lewis, P. A., 177, 329

Lewis, W. H., 183

Life span, 360

Light, 184, 252

Lillie, F. R., 226, 227

Linkage, 105-122

Litchfield, Henrietta, 337

Livestock improvement, 347

Locus (loci), 110, 311

Loeb, J., 231

Lymantria, 228

M

MacArthur, J. W., 220

McBatts, J., 163

McClintic, B. S., 156

McClung, C. E., 205

Maize (see Corn)

Malinowski, Bronislaw, 332

Maloy, B. S., 191

"Mammalian Genetics," 119

Mammals, albinos, 25, 80, 83, 84

chromosomes, 62

hairlessness, 138

intersexes, 225-228

Mammals—(Continued)

linkage in, 119-120

twins, 226, 227

uterine environment, 264, 272

Man, baldness, 139

body hair, 137

brain, 363

brittle bones, 88

cancer, 182-186

chromosomes, 210

circulatory system, 164-176

color blindness, 234-241

crime, 260

diabetes, 179

digestive system, 180-181

digit anomalies, 156-160, 247, 250

dwarfism, 152-155

ear lobes, 143, 144

egg, 57

evolution, 351, 363

excretory system, 178

eyes, 144-151, 265, 271

factor principle in, 74

finger nail biting, 271

hair, color, 131-133

form, 28, 134-137

hairlessness, 138

harelip, 160

health, 365

hemophilia, 243-246

ichthyosis, 141

hystrix gravior, 246, 247

ideals for, 365

improvement, 365-378

inbreeding, 331-337

linkage, 120

mental traits, 191-203, 334-337

in twins, 263-272

mongolism, 275-278

nervous system, 187-203

night blindness, 241

optic nerve atrophy, 241

reproductive system, 182, 224

respiratory system, 176-178

rickets, 254

sex-ratio, 212-214

skeleton and muscles, 151-163

skin color, 74, 126-130, 133

skull shape, 155, 263, 276

Man—(Continued)

- special talents, 198–203
- sperms, 57
- stature, 151–155, 258, 263
- strabismus, 271
- superfluous hair, 138
- sweat glands, absence of, 242
- tanning, 254
- teeth, 142
- tuberculosis, 176–178
- twinning, 219
- tylosis, 141
- variability, 67, 366
- variation, cause of, 64–67
- webbed toes, 247, 250
- weight, 262–265
- white forelock, 129, 130, 132
- white spotting, 126–130
- woolly hair, 134, 135, 136, 137
- Y chromosome inheritance, 246, 247, 250

Manic-depressive psychoses, 197

"*Manual of Psychiatry and Mental Hygiene*," 187, 275

Marriage laws, 331

restrictions, 368

Martynova, R. P., 184

Maternal impressions, 281

Mathematical ability, 201

Mayer, Robert, 197

Meiosis, 54–59, 229

Melanin, 131

Mendel, Gregor Johann, ancestry, home,

schooling, 1, 2

and evolution, 4, 340, 341

as teacher, 2, 3

experiments on beans, 72

experiments on peas, 5–42, 63

investigator, 3–10

Nägeli and, 9, 96

paper on peas, 6

reasons for his success, 9, 11

rediscovery of paper, 93–104

translation of paper on peas, 69

Mendelian ratios, 3:1, 12–16

1:1, 17–21

1:2:1, 27–29, 38

9:3:3:1, 34–36

1:1:1:1, 41

Mendelian ratios—(Continued)

9:7, 70

"*Mendel's Principles of Heredity*," 312

Menschliche Auge und seine Erbanlagen,"

"*Das*, 145

Mental, capacity, range of variability, 192

defectives, and alcohol, 295–297

mongolism, 275–278

sterilization, 350–352

disease, 193–198

and alcohol, 295

sterilization, 369

"impressions," 281

traits, 191–203

twins, 263–272

Metabolism, 224

Metaphase, 49, 50, 51, 52, 210

Mice, harelip in, 161

linkage in, 119

x-rays and, 294

yellow, 88

Microcephalic idiot, 193

Midget, 153, 154, 155

Mirabilis, 9

Missionaries, 373

Mitosis, 48–54

compared with meiosis, 60

discovery of, 48

function, 48, 49, 53

in cancer cells, 183

stages, 49, 50

Mjöen, J. A., 200, 201

Modifications, 345

Mohr, O. L., 134, 258

"Mongolian fold," 147

Mongolism, 275–278

Mongoloids, beard, body hair, 137

eye shape, 147

skull shape, 155

tasters, 188

"Monsters," 222, 326

Moore, C. R., 227

Mörch, E. T., 154

Morgan, T. H., estimate of de Vries, 284

linkage and crossing-over, 106–117

sex-ratio in man, 213

Moron, 192

Mosaic law, 332

Moths, 62, 211

Mulattoes, 74, 133
 Mule, 4, 326
 Muller, H. J., 106, 292, 299
 Multiple alleles, 81-85
 Multiple effects of gene, 85-90
 Müntzing, A., 302
 Muscles, man, 161-163
 Muscular atrophy, 189
 Musical ability, 199
Mutation Theory, "The, 284
 Mutations, causes of, 285, 290-299
 control of, 299
 defined, 285, 286
 Drosophila, 44-45, 89, 107-112, 299
 guinea pigs, 76, 294-298
 nature of, 290-292
 Oenothera, 300
 rate of, 361
 reverse, 25, 290
 x-rays and, 292-294
 Myopia, 31, 149

N

Nägeli, K. W., 9, 96, 205, 353
 Napoleon I, 186
 Natural selection, 244, 341-351
 Nearsightedness, 31, 149
 Nebel, B. R., 301
 Negative eugenics, 368-372
 Negro, blood groups, 170
 blood types, 172, 173
 color blindness, 238
 disease resistance, 177
 sex-ratio, 214
 skull shape, 155
 tasters, 188
 twins, 222
 -White crosses, 74
Negro's Struggle for Survival: a Study in Human Ecology, "The, 177
 Nephritis, 178
"Nervous and Mental Diseases," 191
 Nervous system, 187-203
 Neurofibromatosis, 185
 Newman, H. H., fetal blood vessels, 228
 frequency of identical twins, 222
 studies of twins, 262-272

Newman, H. H.—(Continued)
 twinning in armadillo, 217, 218
 Newt, 217
 Night blindness, 241
 Nordics, eye color, 146
 skull shape, 155
 stature, 151
 Nose bleed, 174
 Nucleic acid, 310

O

Oats, 317
Oenothera, 300, 315
 Oöcyte, 55, 57
 Oögenesis, 55, 56, 57
 Oögonia, 55
 Optic nerve atrophy, 241
 Origin of life, 339
Origin of Species, "The, 4, 5, 286, 339, 346, 350
 Origin of species, hybridization, 355-359
 isolation, 351-353
 natural selection, 244, 341-351
 Orthogenesis, 353
 Otosclerosis, 189
 Otto, J. C., 243
 Ovary, differentiation of, 224
 Ovule, 8

P

Painter, T. S., 306
 Painting, 199, 201
 Palmer, J. H., 349
 Palsy, 190
 Paralysis agitans, 190
 Park, E. A., 255
 Parkes, A. S., 214
 Parkinson's disease, 190
 Parthenogenesis, 228-232, 305
 Patten, B. M., 160
 Patterson, J. T., 208, 218, 219
 Paulsen, 186
 Pearl, Raymond, 17, 178
 Pearson, K., 26
 Peas, blossom, 7, 8
 characters studied by Mendel, 11, 12
 27, 33

- Peas—(Continued)
 chromosomes in, 63
 hybridized with vetch, 4
 linkage in, 118
 Mendel's experiments with, 5-16,
 26-28, 33-37, 40-42
 starch grains, 312
 sweet, 69, 105
 varieties, 7, 11
- Penrose, L. S., 276, 277
- Pessikova, L. N., 179
- Petal, 7
 function of bright colors, 29
- Phenotype, 37
- Phenyl-thio-carbamide, 187
- Philp, J., 58
- Physical Basis of Heredity*," "The, 108
- Physiology of the Elephant*," "The, 361
- Physiology of Twinning*," "The, 218
- Pick's disease, 30
- Piebald, guinea pig, 77, 273
 man, 126, 127, 128
- Pigmentation, effect of age of mother,
 273
 in cats, 256
 in cattle, 37-39
 in guinea pigs, 75-85, 273
 in man, 24, 126-134, 145-147
 in rabbits, 256
 in sweet peas, 69
- Pincus, G., 231, 232
- Pistil, 7, 8
- Placenta, 219, 265, 281
- "*Plant Hybridization before Mendel*," 96
- Polar body, 55, 57
- Polled cattle, 38, 39
- Pollen, 8, 9, 12
 tube, 8
- Pollination, 8, 9
- Polycystic kidney, 179
- Polydactyly, 156, 157
- Polygamy, 350
- Polynesians, 170
- Polyploids, 63, 300-305, 355-359
- Poole, C. F., 333
- Popenoe, Paul, 260
- Position effect, 314
- Positive eugenics, 372-376
- Powell, E. F., 143
- Presence and Absence Hypothesis, 91
- Primrose, 255
- Probability, law of, 19, 24, 42-45, 94
- Prophase, 49, 50, 51, 52
- Protective coloration, 76
- Prosis, 149
- Puberty, 224
- Puffballs, 343
- Puffer, R. P., 178
- Punnett, R. C., 69, 105
- Pygmies, 151, 154, 155
- Pyloric stenosis, 180
- Q
- Quadruplets, armadillos, 218
- Queen Victoria, 244, 245
- R
- Rabbits, color of fat, 314
 giants and dwarfs, 152
 Himalayan, 256
 linkage, 119
 multiple alleles, 81
 parthenogenetic, 232
- Racial differences, in color blindness, 238
 in disease resistance, 177
 in intelligence, 367
 in muscles, 163
 in percentage identical twins, 222
 in taste ability, 188
 significance of, 366
- Radish-cabbage hybrid, 355-358
- Radium, 293
- Raphanus*, 356
- Rat, alcohol-treated, 297
 alleles, 82
 linkage in, 119
 rickets in, 255
 sex-ratio, 214
- "*Recent Advances in Cytology*," 52
- "*Recent Advances in Plant Genetics*," 58
- Recessive, defined, 12
- Recombinations (See Crossovers)
- Reduction division, 55
 discovery, 59
 grasshoppers, 58
 honeybee, 228
 lacking in aphids, 228, 229

Reproductive system, man, 182, 224
 Research, 375
 Retinal glioma, 186
 Reversion, 15, 72
 Rh factor, 172
 Rickets, 254, 282
 Rischbieth, 153
 Roberts, E., 242
 Roberts, H. F., 96
 Rodents, 76, 81
 Rosanoff, A. J., amaurotic idiocy, 193
 criminality, 261
 Huntington's chorea, 191
 intelligence tests, 192
 manic-depressive psychoses, 197
 mongolism, 275-277
 schizophrenia, 195-197
 Ross, T., 238
 "Royal jelly," 230
 Rupture, 161
 Ruttle, M. L., 301

S

Saffron, 301
 Saint Vitus's dance, 191
 Salivary gland chromosomes, 306-311
 Salmon, M. R., 188
 Sansome, F. W., 58, 304
 Sarcoma, 182
 Sawin, P. B., 119
 Schizophrenia, 194-197
 Schofield, R., 247, 250
 Schokking, C. Ph., 136
 School teachers, 374
 Schrader, F., 51
 Sciara, 310
Scientific Basis of Evolution, "The, 117, 284
 Seashore, C. E., 199
 Segregation of defectives, 368
 principle of, 14
 Selection, 311, 325-333
 Self-fertilization, 317-320
 peas, 7, 8, 14, 15
 Self-pollination, 7
 Sex, characters, 223-228, 350
 chromosomes, birds, 211
 Drosophila, 208, 209
 fishes, 211
 Sex—(Continued)
 chromosomes—(Continued)
 grasshoppers, 206
 human, 210
 moths, 211
 sterility and, 297
 control, 214
 determination, honeybee, 229, 230
 XO type, 207-209, 211
 XY type, 208-211
 differentiation, 223-231
 hormones, 224-228
 "Sex-determiner," 206
 Sex-linked characters, 234-246
 Sex-ratio, grasshoppers, 206
 mammals, 212, 214
 man, 212-214
 twins, 215-222
 Sex-reversal, 225-227
 Sexual reproduction, 361
 selection, 350
 Sharp, L. W., 314, 357
 Shuey, A. M., 238
 Siamese twins, 222
 Silzynski, B. M., 308
 Simmons, V. L., 228
 Sjögren, Torsten, 334
 Skeleton and muscles, 151-163
 Skin, abnormalities, 28, 126
 color in man, 74, 126-130, 133, 254
 development of, 133, 140
 Skull shape, 155, 263
 Snapdragons, 302, 361
 Snyder, L. H., 188
Solanum, 302
Solenobia, 305
 Sonn, 172
 Spastic paraplegia, 32
 Species, experimentally produced, 355-359
 origin of, 244, 341-359
 Species hybrids, 326, 355
 Spencer, Herbert, 346
 Spermathecae, 89, 90
 Spermatid, 55, 56
 Spermatocyte, 54, 55
 Spermatogenesis, 54, 55, 56
 Spermatogonia, 54, 55, 210
 Spermatozoa (See Sperms)

- Sperms, human, 54
 in animals, 54, 55, 56
 plants, 8, 12
 two size groups, 213
 Spinal ataxia, 190
 Spindle, 49, 50, 51
 Spores in plants, 50
 Sport, 284
 Sprague, G. F., 330
 Stadler, L. J., 293
 Stamen, 7, 8
 Stanley, W. M., 289, 290
 Starch grains, 312, 314
 "Statistical Methods for Research Workers,"
 43
 Stature, 151-155
 Stefansson, V., 132
 Sterilization, 369
 Stevens, N. M., 206
 Stillbirths, 213
 Stockard, C. R., 296
 Stomach, cancer, 186
 constriction, 180
 Strabismus, 271
 Strandskov, H. H., 294, 323, 324
 Streeter, G. L., 255
 Struggle for existence, 345
 "Studies in the Genetics of *Drosophila*,"
 208
 Sturtevant, A. H., 106, 116, 228
 Subsidizing the fit, 373
 Sugar cane, 330
 Sundfor, Hans, 127
 Survival of the fittest, 346
 Sutton, W. S., 48
 Sweat glands, absence of, 242
 Swezy, Olive, 210
 Synapsis, 54, 55
 Syndactyly, 159
 Syphilis, congenital, 282
 deafness, 188
 feble-mindedness, 193
- T**
- Talents, special, 198-203
 Talmud, 243
 "Tanning," 254
 Tasters, 187
 Teeth, absent, 142
 Teeth—(Continued)
 defective, 242
 dentin, 142
 Telangiectases, 174
 Telophase, 49, 50, 51, 52
 Temperature, and chromosome changes,
 301
 and development, 255, 256, 257
 and mutations, 292
 Termites, 343
 Testes, differentiation of, 224
 Tetrads, 55, 56, 112, 113
 Tetraploids, 301-304, 355-359
 Thompson, J. W., 163
 Titian, painter, 201
 Toes in guinea pig, 273-275
 Tomato, 301, 304
Tradescantia, 304
 Trasoff, A., 179
Trichoniscus, 305
 Trihybrids, 40-41
Triturus, 305
 Trotter, M., 138
 Tschermak, Erich, 100
 Tuberculosis, 176-178, 323, 328
 Tumors, 182-186
 Turner, painter, 199
 Twinning, 217-223
 "Twins: A Study of Heredity and Environ-
 ment," 262
 Twins, cattle, 227
 cause and sex-ratio, 215-223
 environment of, 260
 identical and fraternal, 215-223, 260-
 272
 mental disease in, 198
 Mongolism in, 275-278
 musical talent in, 200
 Siamese, 222
 tuberculosis in, 178
 Tylosis, 141
- U**
- Ulcers, 181
 Ultraviolet rays, 252-255, 291, 293
 "Unit characters," 69, 72
 United States, birth control, 345
 marriage laws, 331
 population growth, 344

United States—(*Continued*)
 sex-ratio, of births, 212
 of twins, 220
 Uranium, 360

V

Van Beneden, E., 59
 Variation, cause of, in man, 65–67
 environmental, 345
 factors in, 105
 hereditary, 345
 human, 366
*Variation of Animals and Plants under
 Domestication,* "The, 4
 Varicose veins, 175
 Verschuer, O. F., 178
 Vestigial wing, 17, 18
 Vetch, hybridized with pea, 4
 Victoria, Queen, 244, 245
 Vigor, 316, 319, 322–331
 "Virus Diseases," 290
 Viruses, 287, 288–290, 339
 Vitamin A, 241, 304
 Vitamin C, 304
 Vitamin D, 255
 von Recklinghausen's disease, 185, 371

W

Waal, G. H. M., 239
 Waardenburg, P. J., 144, 146, 239, 241
 Wahl, H. A., 63
 Waldeyer, W., 16
 Wallace, A. R., 341
 Waller, R. K., 173
 Webbed toes, 247, 250
 Weismann, A., 97
 West, L. S., 162
 Wheat, chromosome numbers, 302
 White, M. J. D., 359
 White forelock, 129, 130, 131
 White spotting, dogs, 127
 guinea pigs, 273
 man, 126–130

Whitefish, mitosis in, 49
 Whitney, D. D., 143
 Wiener, A. S., 144, 168–174
 Wightman, J. C., 160
 Wilson, E. B., artificial parthenogenesis
 231
 parthenogenesis in insects, 229
 sex determination, 206, 208
 two size-groups in sperms, 214
 Winkler, F. B., 302
 Woods, H. M., 297
 Wright, Sewall, albino series in guinea
 pigs, 83–85
 color factors in guinea pigs, 77
 effect of parent's age, 272–275
 eight-factor cross, 77–79
 evolution, factors of, 342, 352, 362
 guinea pigs and tuberculosis, 177, 329
 inbreeding and crossbreeding, 320–329
 isolation by distance, 352
 natural selection, 342
 nature of recessive mutations, 290

X

X chromosome, *Drosophila*, 209
 grasshoppers, 206
 human, 210
 squash bug, 207
 Xeroderma pigmentosum, 184
 X-rays, chromosome changes, 301, 308
 chromosome doubling, 301
 guinea pigs and, 294
 mice and, 294
 mutations, 292–294

Y

Y chromosome, 208, 209, 210
 inheritance, 246–247
 Yolk sac, 219

Z

Zilva, S. S., 304