

CONTENTS

Preface	xi		
Chapter 1 Genes: How they are inherited	1	Chapter 4 A simple model: Hardy–Weinberg equilibrium	35
Blood and ABO blood groups	1	The gene pool with no evolution: The Hardy–Weinberg principle	35
Inheritance of ABO blood groups	3	Exceptions	38
Inheritance of more than one gene: ABO and rhesus blood groups	4	A real-life example	39
Sex chromosomes	9	Some practical uses for Hardy–Weinberg	41
Determining how traits are inherited: Pedigree analysis	10	Chapter 5 Evolutionary forces	45
What is—and isn't—inherited	12	Non-random mating	45
Concluding remarks	14	Small population size	48
		Mutation	53
Chapter 2 What genes are, what they do, and how they do it	15	Migration	56
Chromosomes, proteins, and nucleic acids: Figuring out what genes are	15	Selection	60
The structure of genes and what they do: The central dogma and the flow of information	18	Evolutionary forces: Summary	68
How genes do what they do: Transcription and translation	19	Chapter 6 Molecular evolution	69
The genetic code	22	Functionally less important molecules (or parts of molecules) evolve faster than more important ones	70
DNA replication	23	Conservative substitutions occur more frequently than disruptive ones	71
The consequences of mutations	23	The rate of molecular evolution is approximately constant	72
What causes mutations?	25	Contrasting phenotypic and molecular evolution	73
A final cautionary note	26	How do new gene functions arise?	74
		Gene regulation and phenotypic evolution	77
Chapter 3 Genes in populations	27	Chapter 7 Genetic markers	79
What is a population?	27	Classical markers: Immunogenetic markers	79
The concept of “effective population size”	28	Classical markers: Biochemical polymorphisms	81
The sex ratio and N_e	29	The first DNA markers: Restriction fragment length polymorphisms	84
Inbreeding and N_e	30	Polymerase chain reaction	86
Variation in population size over time and N_e	30	DNA sequencing: The sanger method	89
Differential fertility and N_e	31		
N_e for humans	33		

Next-generation sequencing	90	The genetic evidence: mtDNA	222
Targeting single DNA bases: SNPs	92	The genetic evidence: Y chromosome	224
Variation in length	94	The genetic evidence: Autosomes	225
Other structural variation	99		
Concluding remarks	100		
Chapter 8 Sampling populations and individuals	103	Chapter 15 Ancient DNA	229
<i>Sampling populations: General issues</i>	103	Properties of ancient DNA: Degradation	229
<i>Sampling populations: Ethical issues</i>	105	Properties of ancient DNA: Damage	229
Archival samples	108	Properties of ancient DNA: Contamination	232
		History of ancient DNA studies	236
		Ancient DNA: Archaic humans	237
		Other uses for ancient DNA	244
Chapter 9 Sampling DNA regions	111	Chapter 16 Dispersal and migration	247
Mitochondrial DNA	111	Out of Africa—how many times, when, and which way did they go?	251
Y chromosomal DNA	116	Into remote lands: The colonization of the Americas	259
Autosomal DNA	119	Into even more remote lands: The colonization of Polynesia	267
X chromosome DNA	121	Some concluding remarks	281
Public databases	122		
Chapter 10 Analysis of genetic data from populations	125	Chapter 17 Species-wide selection	283
Genetic diversity within populations	125	Species-wide selection	284
Genetic distances between populations	128	Nonsynonymous mutations and the dN/dS ratio	284
Displaying genetic distance data: Trees	135	Tests based on the allele frequency distribution	288
Displaying genetic data: Multidimensional scaling, principal components, and correspondence analysis	139	Selection tests based on comparing divergence to polymorphism	293
		Archaic genomes	297
Chapter 11 Analysis of genetic data from individuals	147	Chapter 18 Local selection	299
<i>Genetic distances for DNA sequences</i>	147	Example: Lactase persistence	304
Trees for DNA sequences	153	Example: EDAR	309
Rooting trees	156	Ancient DNA	318
Assessing the confidence of a tree	157	Concluding remarks	318
Network analyses	160		
Genome-wide data: Unsupervised analyses	161	Chapter 19 Genes and culture	321
Chapter 12 Inferences about demographic history	175	Are humans still evolving?	321
Dating events	175	Genetic variation can be directly influenced by cultural practices	322
Population size and population size change	187	Genetic variation can be indirectly influenced by cultural practices	322
Migration and admixture	194	Using genetic analyses to learn more about cultural practices: Agricultural expansions	326
Putting it all together	197	Using genetic analyses to learn more about cultural practices: Language replacements	332
Chapter 13 Our closest living relatives	201	Using genetic analyses to learn more about cultural practices: Dating the origin of clothing	333
Resolving the trichotomy	205	Concluding remarks	339
Complications	206		
Ape genetics and genomics	208		
Chapter 14 The origins of our species	211		
Human origins: The fossil record	215		
Models for human origins	218		

Chapter 20 Ongoing and future developments in molecular anthropology

More—and different kinds of—data: The other “omics”	341
Beyond “you”: The microbiome	344
More analyses	347

Relating phenotypes to genotypes	351
Personal ancestry testing and genomics	360

References	363
Suggestions for additional reading	373
Index	375