

Contents

Preface	xi
Acknowledgments	xv
Supplements	xvi

CHAPTER 1

Introduction to Physical Anthropology 2

The Human Connection	6
Biocultural Evolution	6
What Is Anthropology?	10
Cultural Anthropology	11
Linguistic Anthropology	11
Archaeology	11
Physical Anthropology	12
Applied Anthropology	19
Physical Anthropology and the Scientific Method	19
The Anthropological Perspective	21
■ Why It Matters	22
■ Physical Anthropology in Practice Forensic Anthropology in the Twenty-First Century	22
Summary of Main Topics	23
Critical Thinking Questions	23

CHAPTER 2

The Development of Evolutionary Theory 24

A Brief History of Evolutionary Thought	26
The Scientific Revolution	28
Precursors to the Theory of Evolution	29
The Discovery of Natural Selection	33
In Darwin's Shadow	37
Natural Selection	38
Natural Selection in Action	39

Quick Review The Mechanism of Natural Selection	41
--	----

Natural Selection and Reproductive Success	41
Constraints on Nineteenth-Century Evolutionary Theory	42
Opposition to Evolution Today	43
A Brief History of Opposition to Evolution in the United States	43

■ Why It Matters	46
-------------------------	----

■ Physical Anthropology in Practice Are We still Evolving?	46
---	----

Summary of Main Topics	47
Critical Thinking Questions	47

CHAPTER 3

The Biological Basis of Life 48

Cells	50
From DNA to Protein	52
DNA Structure	52
DNA Replication	53
Protein Synthesis	54
What Is a Gene?	57
Regulatory Genes	58
Quick Review Coding and Noncoding DNA	59
Cell Division	59
Chromosomes	60
Mitosis	62
Meiosis	62
New Frontiers	66
■ Why It Matters	69
■ Physical Anthropology in Practice Solving Crimes: Forensics and DNA	70
Summary of Main Topics	70
Critical Thinking Questions	71

CHAPTER 4

Heredity and Evolution 72

The Genetic Principles Discovered by Mendel 75

Segregation 76

Dominance and Recessiveness 77

Independent Assortment 78

Mendelian Inheritance in Humans 79

Misconceptions about Dominance and Recessiveness 81

Polygenic Inheritance 81

Quick Review Mendelian vs. Polygenic Traits 83

Genetic and Environmental Factors 84

Mitochondrial Inheritance 84

Modern Evolutionary Theory 85

The Modern Synthesis 85

A Current Definition of Evolution 85

Factors That Produce and Redistribute Variation 86

Mutation 86

Gene Flow 86

Genetic Drift and Founder Effect 87

Recombination 89

Natural Selection Is Directional and Acts on Variation 90

Review of Genetics and Evolutionary Factors 92

■ **Why It Matters** 93

■ **Physical Anthropology in Practice** Tracing Your Genetic Lineage 94

Summary of Main Topics 94

Critical Thinking Questions 95

CHAPTER 5

Processes of Macroevolution 96

How We Connect: Discovering the Human Place in the Organic World 98

Principles of Classification 100

Constructing Classifications and Interpreting Evolutionary Relationships 101

Comparing Evolutionary Systematics with Cladistics 101

An Example of Cladistic Analysis: The Evolutionary History of Cars and Trucks 102

Using Cladistics to Interpret Organisms 103

Definition of Species 105

Interpreting Species and Other Groups in the Fossil Record 106

Recognition of Fossil Species 107

Recognition of Fossil Genera 108

What Are Fossils and How Do They Form? 109

Vertebrate Evolutionary History: A Brief Summary 111

Mammalian Evolution 113

The Emergence of Major Mammalian Groups 115

Processes of Macroevolution 115

Adaptive Radiation 115

Generalized and Specialized Characteristics 116

Working Together: Microevolution and Macroevolution 117

■ **Why It Matters** 118

■ **Physical Anthropology in Practice** How Do Fossils Form? 118

Summary of Main Topics 119

Critical Thinking Questions 119

CHAPTER 6

An Overview of the Primates 120

Primate Characteristics 122

Limbs and Locomotion 123

Dentition and Diet 124

The Senses and the Brain 124

Maturation, Learning, and Behavior 126

Primate Adaptations 126

Evolutionary Factors 126

Geographical Distribution and Habitats 127

Diet and Teeth 130

Locomotion 131

Primate Classification 132

A Survey of the Living Primates 134

Lemurs and Lorises 134

Tarsiers 136

Anthropoids: Monkeys, Apes, and Humans 137

Hominoids: Apes and Humans 142

Endangered Primates 150

The Bushmeat Trade 154

■ **Why It Matters** 156

■ **Physical Anthropology in Practice** Where Do Humans Fit in the Primate Lineage? 156

Summary of Main Topics 157

Critical Thinking Questions 157

CHAPTER 7

Primate Behavior 158

The Evolution of Behavior 160

Some Factors That Influence Social Structure 162

Why Be Social? 164

Quick Review Primate Social Strategies 165

Primate Social Strategies 166

Dominance 166

Communication 167

Aggressive Interactions 168

Affiliation and Altruism 170

Reproduction and Reproductive Behaviors 172

Female and Male Reproductive Strategies 173

Sexual Selection 174

Is Infanticide a Reproductive Strategy? 175

Mothers, Fathers, and Infants 176

Primate Cultural Behavior 178

Language 182

The Evolution of Language 185

Quick Review Evolution of Human Language 185

The Primate Continuum 186

■ **Why It Matters** 187

■ **Physical Anthropology in Practice** Does Culture Exist in Nonhuman Primates? 188

Summary of Main Topics 188

Critical Thinking Questions 189

CHAPTER 8

Primate and Hominin Origins 190

Early Primate Evolution 192

Eocene Primates: Closer Connections to Living Primates 192

Oligocene Primates: Anthropoid Connections 194

Miocene Fossil Hominoids: Closer Connections to Apes and Humans 195

Understanding the Human Connection to Other Primates: Biocultural Evolution 198

Discovering Human Evolution: The Science of Paleoanthropology 199

Early Hominin Tools 200

Connecting the Dots through Time:

Paleoanthropological Dating Methods 201

Understanding Our Direct Evolutionary Connections: What's a Hominin? 203

What's in a Name? 204

Walking the Walk: The Bipedal Adaptation 205

The Mechanics of Walking on Two Legs 206

Digging for Connections: Early Hominins from Africa 209

Quick Review Key Pre-Australopith Discoveries 210

Pre-Australopiths (6+–4.4 mya) 210

Australopiths (4.2–1.2 mya) 215

Later More Derived Australopiths (3–1.2 mya) 219

New Connections: A Transitional

Australopith? 223

Closer Connections: Early *Homo* (2+–1.4 mya) 224

Interpretations: What Does It All Mean? 227

Seeing the Big Picture: Adaptive Patterns of Early African Hominins 228

■ **Why It Matters** 229

■ **Physical Anthropology in Practice** The Piltdown Controversy 230

Summary of Main Topics 230

What's Important Key Early Hominin Fossil Discoveries from Africa 231

Critical Thinking Questions 231

CHAPTER 9

The First Dispersal of the Genus *Homo*: *Homo erectus* and Contemporaries 232

A New Kind of Hominin 234

The Morphology of *Homo erectus* 235

Body Size 235

Brain Size 235

Cranial Shape 238

The Geographical Range of *Homo erectus* 239

The First *Homo erectus*: *Homo erectus* from Africa 239

Quick Review *Homo erectus* Discoveries from Africa 241

Who Were the Earliest African Emigrants? 241

Homo erectus from Indonesia 243

Homo erectus from China 244

Quick Review Key *Homo Erectus* Discoveries from Asia 246

Asian and African *Homo erectus*:

A Comparison 247

Later *Homo erectus* from Europe 248

Quick Review Key *Homo Erectus* and
Contemporaneous Discoveries from Europe 249

Technological Trends During the Time of *Homo erectus* 249

Seeing the Connections: Interpretations of *Homo erectus* 250

■ **Why It Matters** 251

■ **Physical Anthropology in Practice** Evidence for
Meat Consumption in *Homo erectus*? 252

Summary of Main Topics 252

What's Important Key Fossil Discoveries of *Homo erectus* 253

Critical Thinking Questions 253

CHAPTER 10

Premodern Humans 254

When, Where, and What 256

The Pleistocene 256

Dispersal of Middle Pleistocene Hominins 257

Middle Pleistocene Hominins: Terminology 258

Premodern Humans of the Middle Pleistocene 259

Africa 259

Quick Review Key Premodern Human
(*H. heidelbergensis*) Fossils from Africa 260

Europe 260

Quick Review Key Premodern Human
(*H. heidelbergensis*) Fossils from Europe 261

Asia 261

Quick Review Key Premodern Human
(*H. heidelbergensis*) Fossils from Asia 264

A Review of Middle Pleistocene Evolution 264

Middle Pleistocene Culture 265

Neandertals: Premodern Humans of the Late
Pleistocene 266

Western Europe 269

Central Europe 270

Western Asia 272

Central Asia 273

Quick Review Key Neandertal Fossil Discoveries 274

Culture of Neandertals 274

Technology 275

Subsistence 275

Speech and Symbolic Behavior 276

Burials 277

Molecular Connections: The Genetic Evidence 277

Neandertal DNA 278

Seeing Close Human Connections: Understanding
Premodern Humans 279

■ **Why It Matters** 282

■ **Physical Anthropology in Practice** What Did the
Neandertals Eat? 282

Summary of Main Topics 283

What's Important Key Fossil Discoveries of
Premodern Humans 283

Critical Thinking Questions 283

CHAPTER 11

The Origin and Dispersal of Modern Humans 284

Approaches to Understanding Modern Human
Origins 287

The Regional Continuity Model: Multiregional
Evolution 287

Replacement Models 287

The Earliest Discoveries of Modern Humans 290

Africa 290

The Near East 293

Asia 294

Quick Review Key Early Modern *Homo sapiens*
Discoveries from Africa and the Near East 295

Australia 297

Central Europe 298

Western Europe 300

Quick Review Key Early Modern *Homo sapiens*
Discoveries from Europe and Asia 301

Something New and Different: The "Little People" 301

Technology and Art in the Upper Paleolithic 304

Europe 304

Africa 307

Summary of Upper Paleolithic Culture 309

■ **Why It Matters** 309

■ **Physical Anthropology in Practice** Why Aren't
Modern Humans Genetically Diverse? 310

Summary of Main Topics 310

What's Important Key Fossil Discoveries of Early
Modern Humans and *Homo floresiensis* 311

Critical Thinking Questions 311

CHAPTER 12

Human Variation and Adaptation 312

Historical Views of Human Variation 314

The Concept of Race 315

Contemporary Interpretations of Human Variation 318

Human Polymorphisms 319

Polymorphisms at the DNA Level 319

Human Biocultural Evolution 320

Population Genetics 323

The Adaptive Significance of Human Variation 323

Solar Radiation and Skin Color 324

The Thermal Environment 329

High Altitude 332

Infectious Disease 334

The Continuing Impact of Infectious Disease 335

■ **Why It Matters** 339

■ **Physical Anthropology in Practice** Do Forensic Anthropologists Estimate Race? 339

Summary of Main Topics 340

Critical Thinking Questions 341

CHAPTER 13

Legacies of Human Evolutionary History: Effects on the Life Course 342

Evolved Biology and Contemporary Lifestyles—Is there a Mismatch? 344

Biocultural Evolution and the Life Course 345

Diet and Nutrition through the Life Course 346

Too Much and Too Little 348

Other Factors Influencing Growth and Development: Genes, Environment, and Hormones 350

Life History Theory and the Human Life Course 352

Pregnancy, Birth, Infancy, and Childhood 353

Onset of Reproductive Function in Humans 356

Decline in Reproductive Function 357

Aging and Longevity 358

Are We Still Evolving? 361

■ **Why It Matters** 362

■ **Physical Anthropology in Practice** Did the

Paleolithic Diet Really Exist? 362

Summary of Main Topics 363

Critical Thinking Questions 363

CHAPTER 14

The Human Disconnection 364

Human Impact on the Planet and on Other

Life-Forms 366

Humans and the Impact of Culture 367

Global Climate Change 368

Public Perceptions of Climate Change 369

Earth's Shrinking Polar Ice 370

Impact on Biodiversity 374

Acceleration of Evolutionary Processes 376

Looking for Solutions 377

Is There Any Good News? 379

■ **Why It Matters** 380

■ **Physical Anthropology in Practice** Is There Really an Anthropocene? 380

Summary of Main Topics 380

Critical Thinking Questions 381

APPENDIX A

Atlas of Primate Skeletal Anatomy 382

APPENDIX B

Summary of Early Hominin Fossil Finds from Africa 390

APPENDIX C

Population Genetics 395

APPENDIX D

Sexing and Aging the Skeleton 398

Glossary 403

Bibliography 412

Index 428