

CONTENTS

CHAPTER 1 *AN INTRODUCTION* 1

PART I SPACE AND LIFE

CHAPTER 2 *SOME BASICS* 9

- Biology and the Hierarchies of Life 9
 - Taxonomic Hierarchy 9
 - Ecological Hierarchy 15
 - Trophic Hierarchy 16
- Physical Geography and the Functioning of the Earth 22
 - Global Climate 23
 - Microclimate 31
 - World Soils 32
 - The Physical Environment of Lakes 35
 - The Physical Environment of Oceans 38

CHAPTER 3 *THE PHYSICAL ENVIRONMENT AND THE DISTRIBUTION OF LIFE* 43

- Light 45
- Temperature 47
 - Plants 48
 - Animals 54
- Moisture 60
 - Plants 60
 - Animals 65
- Other Physical Factors 66
- Interacting Physical Controls on Geographic Distributions 68
- Environmental Gradients and Species' Niches 70

CHAPTER 4 *BIOLOGICAL INTERACTIONS AND THE DISTRIBUTION OF LIFE* 77

- Predation 77
- Competition 83
- Symbiosis: Mutualism, Commensalism, Parasitism, and Mimicry 87
- Combined Physical and Biological Controls on Distribution 90
- Biological Interactions, Gradients, and Niches 91

CHAPTER 5 *DISTURBANCE* 97

- Fire 104
- Wind 113
- Flooding 116

Other Physical Disturbances	122
Pathogens	126
Marine Disturbances	126

CHAPTER 6 *COMMUNITIES, FORMATIONS AND BIOMES* 132

Communities	133
Plant Physiognomy, Vegetation Structure, and Formations	139
Ecological Equivalents, Life Zones, and the Biomes	141
Tropical Rainforest	145
Tropical Seasonal Forest	153
Tropical Savanna	154
Desert	159
The Mediterranean Biome	164
Temperate Grassland	167
Temperate Forests	171
Temperate Rainforest	176
Coniferous Boreal (Taiga) and Montane Forests	178
Tundra	181

PART II *TIME AND LIFE*

CHAPTER 7 *CHANGING CONTINENTS AND CLIMATES* 191

Life and the Geologic Time Scale	191
Shifting Continents	196
Quaternary Climatic Change	205
Future Changes in Continents and Climate	217

CHAPTER 8 *DISPERSAL, COLONIZATION, AND INVASION* 227

Dispersal	228
Colonization, Seasonal Migrations, and Irruptions	234
Diffusion Versus Jump Dispersal	241
Barriers, Corridors, Filters, Stepping Stones, and Sweepstakes	246
Recent Invasions by Exotic Species	252

CHAPTER 9 *EVOLUTION, SPECIATION, AND EXTINCTION* 262

Evolution and Speciation	262
Some Basic Genetics	263
Historical Development of Evolutionary Theory	267
Isolation and Speciation	272
The Temporal Pattern of Evolution	275
Direction in Evolution	277
Perfection in Evolution	278
Increasing Species Diversity	279
Geography and Evolution: Founder Effects, Bottlenecks, Vicariance Events, Adaptive Radiation, and Evolutionary Convergence	280
Extinction	287
The Relationship Between Evolution and Extinction	295

CHAPTER 10 *REALMS, REGIONS, AND PROVINCES: THE BIOGEOGRAPHIC SUBDIVISIONS OF THE EARTH* 299

- Defining Biogeographic Realms, Regions, and Provinces 299
- Determining the Boundaries Between Regions 305
- Factors Behind the Modern Biogeographical Regions 307
 - Evolution of the Mammals 308
 - Evolution of the Flowering Plants 311
- The Modern Biogeographic Regions 315
 - Nearctic and Palearctic Regions—The Holarctic 315
 - Neotropical Region 317
 - Ethiopian (African) Region 319
 - Oriental Region 320
 - Australian Region 321

CHAPTER 11 *BIOGEOGRAPHY AND HUMAN EVOLUTION* 324

- The Primate Linkage 324
- Early Primates 327
- The Hominids: *Australopithecus* 330
- The Hominids: Early *Homo* 336
- The Hominids: *Homo Sapiens* 340
- The Geographic Expansion of Modern Humans 344

CHAPTER 12 *HUMANS AS A FORCE IN EVOLUTION AND EXTINCTION* 350

- Humans as an Evolutionary Force 350
 - Animal and Plant Domestication 351
 - Questions of the Origin and Spread of Agriculture 357
- Humans as a Force of Extinction 362
 - Prehistoric Extinctions 362
 - Historic Extinctions 368

PART III THEORY AND PRACTICE

CHAPTER 13 *DESCRIPTION AND INTERPRETATION OF BIOGEOGRAPHIC DISTRIBUTIONS* 377

- Mapping Biogeographic Distributions 378
- Biogeography of Range Size and Range Shape 380
- Common Biogeographical Distributional Patterns 386
 - Endemic and Cosmopolitan Distributions Revisited 387
 - Continuous Zonal Biogeographic Distributions 388
 - Amphiregional Disjunct Distributions 388
 - Dispersal Disjunctions 389
 - Climatic Disjunctions 390
 - Geologic Disjunctions 391
 - Evolutionary Disjunctions 391
 - Biogeographic Relicts 392
- Biogeographic Distributions and the Reconstruction of Evolutionary History 394
 - Centers of Origin and the Dispersalist Model 395
 - Cladistic Biogeography 396
 - Panbiogeography and Vicariance Models 398
- Beyond Vicariance Biogeography: The Phylogeographic Revolution 402

CHAPTER 14 *THE GEOGRAPHY OF BIOLOGICAL DIVERSITY* **406**

- What is Biological Diversity? **406**
- How Many Different Species are there on the Earth? **409**
- Latitudinal and Altitudinal Diversity Gradients **411**
- Controls on Geographic Gradients of Species Diversity **415**
 - Historical Theories **416**
 - Equilibrium Theories **418**
- Island Biogeography **428**
 - Geographic Patterns of Island Biodiversity **429**
 - The Equilibrium Theory of Island Biogeography **431**
 - The Theory of Island Biogeography Today **439**

CHAPTER 15 *BIOGEOGRAPHY AND THE CONSERVATION CHALLENGE* **451**

- The Value of Conservation **452**
- Endangered and Threatened Species **454**
- Biogeography and Endangered Species **459**
- Biogeography and Conservation Planning **464**
 - General Strategies for Species Conservation and Biodiversity Conservation **466**
 - Habitat Restoration and Conservation **473**
 - The Global Warming Challenge **477**
- Some Reflections **480**

GLOSSARY **485**

PHOTO CREDITS **495**

ILLUSTRATION CREDITS **496**

INDEX **499**