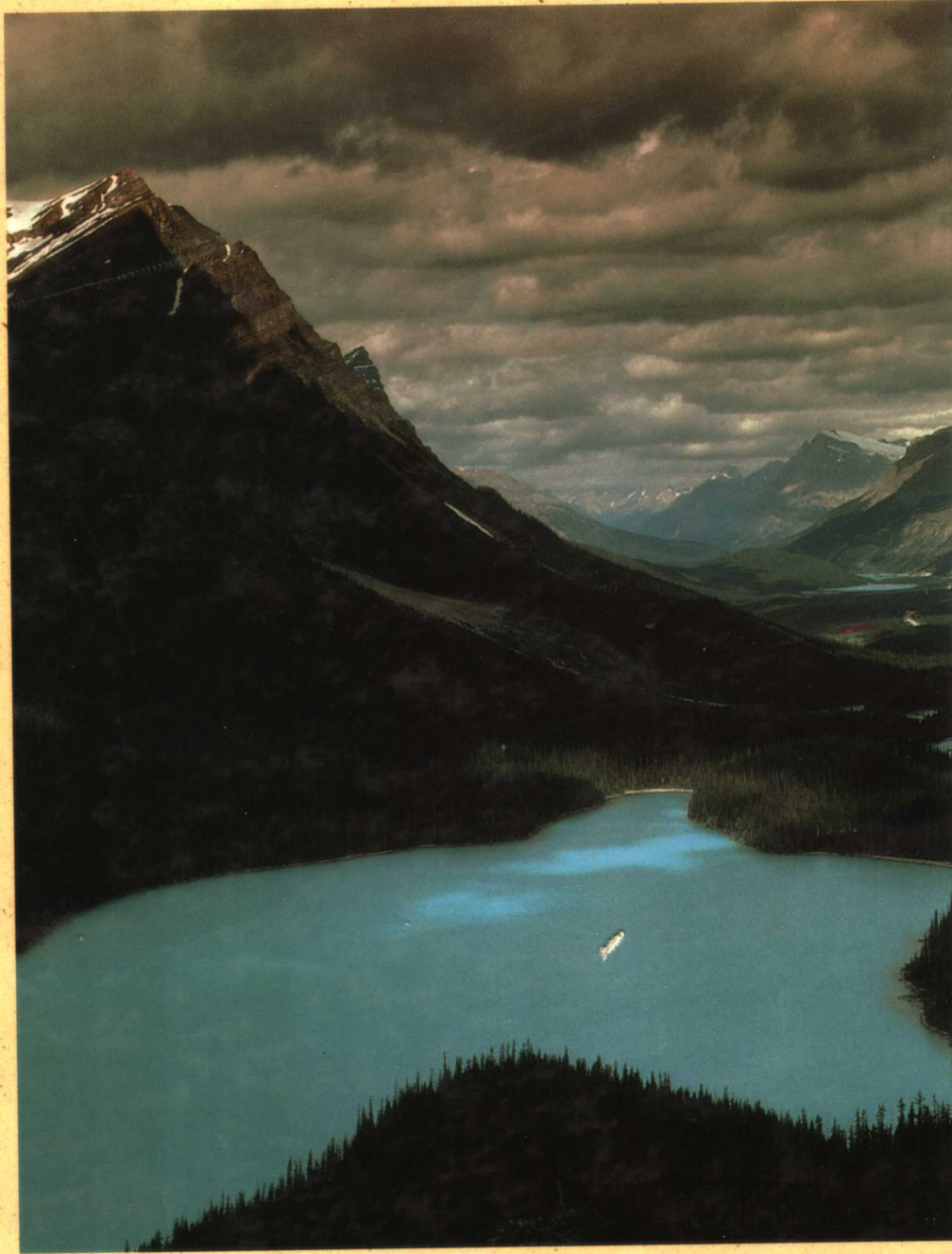
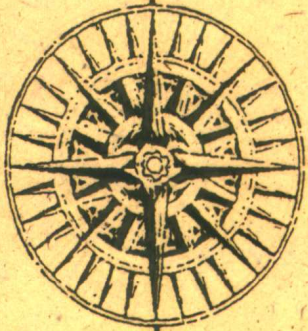


GEOSYSTEMS

An Introduction to Physical Geography



Robert W. Christopherson

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*To all the students of Earth, our home planet,
and a sustainable future.*

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Preface

Geosystems explores the dynamic discipline of physical geography. The goal of physical geography is to explain the spatial dimension of Earth's natural systems—its energy, air, water, weather, climates, landforms, soils, plants, and animals. Earth is a place of great physical and cultural diversity, yet people generally know little of it. Recent headlines have warned: "We Are Geographically Ignorant," or "Environmental Concerns Get Lost on the Map!" The 1990s will be a time of critical questions and developments concerning human-environment themes, for many significant changes already are under way. Geography, as a spatial human-Earth science, is in a unique position among the sciences to synthesize and integrate the great physical and cultural diversity facing us. As consumers, voters, and inhabitants of this planet, it is vital to our future that we investigate the life-sustaining environment that surrounds and infuses our lives.

To make this text both informative and enjoyable, particular attention was given to creating a clear writing style and to fully integrating the illustrations with the text. *Geosystems* is carefully organized to help you learn through a logical order and flow of topics. Coverage of essential core materials and inclusion of nonquantitative analyses of Earth's systems results in a text appropriate for both nonmajor and major science students, regardless of your science background.

Geosystems is structured into four parts, each containing related chapters according to the flow of individual systems, or consistent with time and the flow of events. Chapter 1 presents the essentials of physical geography as a foundation, including a discussion of geography, systems analysis, latitude, longitude, time, and the science of mapmaking (cartography). With these essentials learned, each of the four parts then can be covered, either in their presented order or in any sequence.

Part One exemplifies the systems organization of the text, beginning with the origin of the Solar System and the Sun. Solar energy passes across space to Earth's atmosphere (Chapter 2), and through the atmosphere to Earth's surface (Chapter 3). From Earth's surface, seasonal variations and surface energy balances (Chapter 4) generate patterns of world temperature (Chapter 5) and general and local

atmospheric circulations (Chapter 6). Thus, the disciplines of astronomy, geodesy, physics, and other atmospheric sciences are dealt with in Chapters 2 through 6.

Part Two presents aspects of hydrology, meteorology and weather, oceanography, and climate, discussed in a flowing sequence in Chapters 7 through 10. Geography is linked to Earth-system sciences—an influence seen in Chapters 11 through 17 of Part Three—for there we discuss the physical planet and related processes. Earth's surface is a place of an enormous ongoing struggle between the processes that build the landscape and those that tear it down.

Finally, Part Four brings the content of the first three parts together in a section covering biogeography, including soils, plants, animals, and Earth's major terrestrial biomes (Chapters 18 through 20). The text culminates with Chapter 21, "The Human Denominator," a unique capstone chapter that overviews human-environment interactions pertinent to physical geography. This chapter is sure to stimulate further thought and discussion, dealing as it does with the Gaia hypothesis and perhaps the most profound issue of our time, Earth's stewardship.

The text contains many features to assist you as a student of physical geography:

- Each chapter includes a heading outline, review questions, key terms list, and suggested readings.
- Key chapters (climate, soils, biomes) present large, integrative tables to help you synthesize content.
- The glossary provides basic definitions of the key terms and concepts that are printed in **boldface** where they are defined within the text; entries include chapter location. Other important terms are in *italics* for emphasis.
- A student study guide is available to provide additional learning tools, examples, and self-tests.
- The text and all figures use SI—metric/English—measurement equivalencies appropriate to this transition period in the United States and for science courses in general. A complete set of measurement conversions is presented in an easy-to-use arrangement inside the front cover.
- Appendix A contains weather, water balance,

and other data for many cities worldwide, arranged by climate. Appendix B provides address listings for important geographic and environmental organizations, agencies, and general reference works.

- *Geosystems* features over 200 color photos and orbital images, 110 full color maps, 125 creative drawings, and many other illustrations throughout, all carefully selected and prepared to enhance your learning experience.
- Twenty Focus Study essays provide additional explanation and background information on key topics as diverse as the scientific method, the Mount Saint Helens eruption, the status of the Colorado River, fire ecology, and biosphere reserves.
- Although political boundaries come and go, the maps in this book are as up-to-date as possible. They reflect the recent unions in Germany and Yemen. At this writing, the sovereignty status of Western Sahara is unresolved and elections are pending. The situation is also evolving with the republics of the Soviet Union.

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Physical geography teaches us the intricate supporting web that is Earth's environment and the dramatic changes occurring in many human-Earth relationships. All things considered, this is a good time to be enrolled in a relevant geography course! The best to you in your studies.

Robert W. Christopherson
Citrus Heights, California

Brief Contents

- 1 Essentials of Geography 1

PART ONE

The Energy-Atmosphere System 32

- 2 Solar Energy to Earth 34
- 3 Earth's Modern Atmosphere 55
- 4 The Seasons and Energy Balances 83
- 5 World Temperatures 111
- 6 Atmospheric and Oceanic Circulations 137

PART TWO

The Water, Weather, and Climate System 164

- 7 Water and Atmospheric Moisture 167
- 8 Weather 195
- 9 Water Balance and Water Resources 229
- 10 Global Climate Systems 255

PART THREE

The Earth-Atmosphere Interface 290

- 11 The Dynamic Planet 293
- 12 Tectonics and Volcanism 331
- 13 Weathering and Mass Movement 365
- 14 River Systems and Landforms 393
- 15 Eolian Processes and Arid Landscapes 425
- 16 Coastal Processes and Landforms 451
- 17 Glacial Processes and Landforms 479

PART FOUR

Soils, Ecosystems, and Biomes 510

- 18 The Geography of Soils 513
- 19 Ecosystem Essentials 547
- 20 Terrestrial Biomes 577
- 21 The Human Denominator 607

Contents

1

Essentials of Geography 1

THE DISCIPLINE OF GEOGRAPHY 3

The Geographic Continuum 3

EARTH SYSTEMS CONCEPTS 5

Systems Theory 5

Earth as a System 7

Earth's Energy Equilibrium: An Open System ◻

Earth's Physical Matter: A Closed System

Earth's Four Spheres 7

Atmosphere ◻ Hydrosphere ◻ Lithosphere ◻

Biosphere

A SPHERICAL PLANET 8

LOCATION AND TIME ON EARTH 9

Latitude 10

Latitudinal Geographic Zones

Longitude 15

Prime Meridian and Standard Time 18

International Date Line

Great Circles and Small Circles 20

MAPS AND MAP PROJECTIONS 21

The Scale of Maps 21

Map Projections 22

Properties of Projections ◻ The Nature and

Classes of Projections ◻ Maps Used in this Text

Mapping and Topographic Maps 26

SUMMARY 29

FOCUS STUDY 1–1: Measuring Earth in

247 B.C. 11

FOCUS STUDY 1–2: The Search for

Longitude 16

PART ONE

The Energy-Atmosphere System 32



2

Solar Energy to Earth 34

SOLAR SYSTEM: STRUCTURE AND FORMATION 36

Solar System Location 36 Dimensions □ Earth's Orbit

Solar System Formation 37

Earth's Development 38 Earth's Past Atmospheres

SOLAR ENERGY: FROM SUN TO EARTH 41

Solar Operation and Fusion 41

Solar Wind 41 Sunspots and Solar Activity □ Sunspot Cycles

Earth's Magnetosphere 43

Solar Wind Effects 43 Auroras □ Weather Effects

Electromagnetic Spectrum of Radiant Energy 45

ENERGY AT THE TOP OF THE ATMOSPHERE 46

Intercepted Energy 46 Solar Constant □ Uneven Distribution of Insolation

REMOTE SENSING 48

Geographic Information System (GIS) 51

SUMMARY 51

FOCUS STUDY 2-1: The Scientific Method 39

3

Earth's Modern Atmosphere 55

ATMOSPHERIC STRUCTURE AND FUNCTION 57

Air Pressure 58

Atmospheric Composition, Temperature, and Function 60

Heterosphere 61

Thermosphere □ Ionosphere

Homosphere 61

Mesosphere □ Stratosphere and

Ozonosphere □ Troposphere

VARIABLE ATMOSPHERIC COMPONENTS 68

Anthropogenic Pollution 70

Carbon Monoxide □ Photochemical Smog
Reactions □ Ozone Pollution □ Industrial Smog
and Sulfur Oxides

Solutions 79

SUMMARY 79

FOCUS STUDY 3-1: The Stratospheric Ozone
Predicament 64

FOCUS STUDY 3-2: Acid Deposition: A Blight
on the Landscape 75

4

The Seasons and Energy Balances 83

THE SEASONS 84

Seasonality 84

Contributing Physical Factors 85

Revolution □ Rotation □ Tilt of Earth's Axis □
Axial Parallelism

Annual March of the Seasons 88

Seasonal Observations □ Dawn and Twilight
Concepts

ENERGY BALANCE OF THE TROPOSPHERE 91

Energy in the Atmosphere: Some Basics 93

Insolation Input □ Albedo and Reflection □
Scattering (Diffuse Reflection) □ Refraction □
Absorption □ Earth Reradiation and the
Greenhouse Effect

Earth-Atmosphere Radiation Balance 95

Global Net Radiation

EARTH'S SURFACE ENERGY BALANCE 97

Daily Radiation Curves 97

Simplified Surface Energy Balance 98

Net Radiation □ Sample Stations

Urban-Induced Energy Balances 104

SUMMARY 106

FOCUS STUDY 4-1: Solar Energy Collection and
Concentration 101

5

World Temperatures 111

PRINCIPAL TEMPERATURE CONTROLS 112

Latitude 112

Altitude 112

Cloud Cover 116

Land-Water Heating Differences 117

Evaporation ◻ Transmissibility ◻ Specific
Heat ◻ Movement ◻ Ocean Currents ◻
Summary of Marine vs. Continental Conditions

EARTH'S TEMPERATURE PATTERNS 121

January Temperature Map 122

July Temperature Map 124

Annual Range of Temperatures 125

Air Temperature and the Human Body 125

FUTURE TEMPERATURE TRENDS 127

Global Warming 128

Background on Global Warming ◻ Present
Indications and the Future

Global Cooling 132

SUMMARY 133

FOCUS STUDY 5–1: Temperature Concepts,
Terms, and Measurements 113

6

Atmospheric and Oceanic Circulation 137

WIND ESSENTIALS 138

Wind: Description and Measurement 139

Global Winds 139

DRIVING FORCES WITHIN THE ATMOSPHERE 141

Pressure Gradient Force 141

Coriolis Force 143

Friction Force 143

ATMOSPHERIC PATTERNS OF MOTION 144

Primary High-Pressure and Low-Pressure
Areas 145

Equatorial Low-Pressure Trough ◻ Subtropical
High-Pressure Cells ◻ Subpolar Low-Pressure
Cells ◻ Polar High-Pressure Cells

Upper Atmospheric Circulation 151
Jet Streams

Global Circulation Model 152

Local Winds 152
Monsoonal Winds

OCEANIC CURRENTS 160

SUMMARY 161

FOCUS STUDY 6–1: Wind Power: An Energy
Resource 157

PART TWO

The Water, Weather, and Climate System 164



7

Water and Atmospheric Moisture 167

BEGINNINGS 168

Quantity Equilibrium 168

Distribution of Earth's Water Today

Quality (Composition) Equilibrium 170

Salinity

GLOBAL OCEANS AND SEAS 172

Physical Structure of the Oceans 172

UNIQUE PROPERTIES OF WATER 173

Heat Properties 174

Ice, the Solid Phase □ Water, the Liquid

Phase □ Water Vapor, the Gas Phase □ Heat

Properties of Water in Nature

THE HYDROLOGIC CYCLE 178

A Hydrologic Cycle Model 178

HUMIDITY 179

Relative Humidity 180

Expressions of Relative Humidity 181

Vapor Pressure □ Specific Humidity □ Absolute

Humidity □ Instruments for Measurement

Global Distribution of Relative Humidity 183

CLOUDS AND FOG 184

Cloud Formation Processes 184

Raindrop Formation

Cloud Types and Identification 187

Cloud Classes

Fog 189

SUMMARY 191

8

Weather 195

ATMOSPHERIC STABILITY 196

Adiabatic Processes 197

Dry Adiabatic Rate (DAR) ◻ Moist Adiabatic Rate (MAR)

Stable and Unstable Atmospheric Conditions 197

AIR MASSES 198

Air Masses Affecting North America 200

Air Mass Modification 201

ATMOSPHERIC LIFTING MECHANISMS 202

Convictional Lifting 202

Orographic Lifting 202

Orographic Precipitation World Records

Frontal Lifting 205

Cold Front ◻ Warm Front

MIDLATITUDE CYCLONIC SYSTEMS 207

Cyclogenesis: The Birth of a Cyclone 209

Occluded Fronts and a Dissolving Cyclone 210

Daily Weather Map and the Midlatitude Cyclone 211

VIOLENT WEATHER 211

Thunderstorms 211

Lightning and Thunder ◻ Hail

Tornadoes 215

Tropical Cyclones 215

Hurricanes and Typhoons

SUMMARY 220

FOCUS STUDY 8-1: Hurricane Camille: Disaster and Benefit 222

9

Water Balance and Water Resources 229

THE WATER-BALANCE CONCEPT 230

The Water-Balance Equation 230

Precipitation ◻ Potential Evapotranspiration ◻
Determining POTET ◻ Deficit ◻ Surplus ◻ Soil
Moisture Storage

Sample Water Balances 236

Water Management: An Example 239

GROUNDWATER RESOURCES 239

Groundwater Description 239

Groundwater Utilization 241

Pollution of the Groundwater Resource 246

DISTRIBUTION OF STREAMS 247

OUR WATER SUPPLY 247

Daily Water Budget 248

Future Considerations 251

SUMMARY 251

FOCUS STUDY 9-1: Ogallala Aquifer Overdraft 244

CLIMATE SYSTEM COMPONENTS 256

Radiation, Temperature, Pressure, and Air
Masses 256

Precipitation Input 257

Developing Climate Models 262

CLASSIFICATION OF CLIMATIC REGIONS 262

The Köppen Classification System 263

Classification Criteria □ Köppen's Climatic
Designations □ Global Climate Patterns

Tropical A Climates 267

Tropical Rain Forest Climates (Af) □ Tropical
Monsoon Climates (Am) □ Tropical Savanna
Climates (Aw)

Mesothermal C Climates 268

Humid Subtropical Hot Summer Climates (Cfa,
Cwa) □ Marine West Coast Climates (Cfb,
Cfc) □ Mediterranean Dry Summer Climates
(Csa, Csb)

Microthermal D Climates 274

Humid Continental Hot Summer Climates (Dfa,
Dwa) □ Humid Continental Mild Summer
Climates (Dfb, Dwb) □ Subarctic Climates (Dfc,
Dwc, Dwd)

Polar Climates 279

Dry Arid and Semiarid Climates 281

Hot Low-Latitude Desert Climates (BWh) □ Cold
Midlatitude Desert Climates (BWk) □ Hot Low-
Latitude Steppe Climates (BSh) □ Cold
Midlatitude Steppe Climates (BSk)

FUTURE CLIMATE PATTERNS 284

Consequences of Climatic Warming 268

Polar and High-Latitude Warming Effects □
Solutions

SUMMARY 288

FOCUS STUDY 10-1: The El Niño Phenomenon
258

11

The Dynamic Planet 293

THE PACE OF CHANGE 294

EARTH'S SURFACE RELIEF FEATURES 294

Crustal Orders of Relief 296

First Order of Relief ◻ Second Order of Relief
Relief ◻ Third Order of Relief

Earth's Topographical Regions 298

EARTH'S STRUCTURE AND INTERNAL ENERGY 298

Earth in Cross Section 299

Earth's Core ◻ Earth's Magnetism ◻ Earth's
Mantle ◻ Lithosphere and Crust

GEOLOGIC CYCLE 303

Rock Cycle 305

Igneous Processes ◻ Sedimentary Processes ◻
Metamorphic Processes

CONTINENTAL DRIFT 311

A Brief History 315

Sea-Floor Spreading 315

Subduction 317

The Formation and Breakup of Pangaea 318

Pre-Pangaea ◻ Pangaea ◻ Pangaea Breaks
Up ◻ Modern Continents Take Shape ◻ The
Continents Today

PLATE TECTONICS 319

Plate Boundaries 322

Transform Faults ◻ Earthquake and Volcanic
Activity

Hot Spots 323

SUMMARY 326

FOCUS STUDY 11–1: Coal: An Important Sedimentary Rock 312

12

Tectonics and Volcanism 331

THE OCEAN FLOOR 332

CRUSTAL FORMATION PROCESSES 332

Continental Crust 332

Terranes

Deformation Processes 335

Folding ◻ Faulting

Orogenesis 340

Types of Orogenies ◻ Appalachians

World Structural Regions 344

EARTHQUAKES 344

Earthquake Essentials 344

The Nature of Faulting ◻ The San Francisco
Earthquakes

Paleoseismology and Earthquake

Forecasting 348

Earthquake Preparedness and Planning

VOLCANISM 351

Locations of Volcanic Activity 352

Types of Volcanic Activity 352

Effusive Eruptions ◻ Explosive Eruptions

SUMMARY 361

FOCUS STUDY 12–1: The 1980 Eruption of Mount Saint Helens 357

13

Weathering and Mass Movement 365

LANDMASS DENUDATION 366

Early Theories 367

Dynamic Equilibrium Approach to Landforms 368

Slopes

WEATHERING PROCESSES 370

Physical Weathering Processes 372

Crystallization □ Freeze-Thaw Action □

Pressure-Release Jointing

Frozen Ground Phenomena 375

Chemical Weathering Processes 376

Hydrolysis and Hydration □ Carbonation and Solution

Karst Topography and Landscapes Dominated by Solution 377

Caves and Caverns

MASS MOVEMENT PROCESSES 380

Mass Movement Mechanics 381

The Role of Slopes

Classes of Mass Movements 383

Fall □ Slide □ Flow □ Creep

Human-Induced Mass Movements 386

SUMMARY 388

14

River Systems and Landforms 393

FLUVIAL PROCESSES AND LANDSCAPES 394

The Drainage Basin System 395

Drainage Density and Patterns □ Stream Orders

Streamflow Characteristics 400

Stream Erosion □ Stream Transport □ Flow

Characteristics and Channel Patterns

Stream Gradient 406

Nickpoints □ The Davis Geomorphic Cycle

Stream Deposition 410

Floodplains □ Stream Terraces □ River Deltas

FLOODS AND RIVER MANAGEMENT 416

Streamflow Measurement 416

Hydrographs

Additional Flood Considerations 417

SUMMARY 421

FOCUS STUDY 14-1: Floodplain Management Strategies 418

15

Eolian Processes and Arid Landscapes 425

THE WORK OF WIND 426

Eolian Erosion 426

Deflation □ Abrasion

Eolian Transportation 428

Eolian Depositional Landforms 429

Dune Movement and Form

Loess Deposits 431

OVERVIEW OF DESERT LANDSCAPES 434

Desert Fluvial Processes 435

Alluvial Fans

Desert Landscapes 444

Basin and Range

SUMMARY 447

FOCUS STUDY 15–1: The Colorado River: A System Out of Balance 439

16

Coastal Processes and Landforms 451

COASTAL SYSTEM COMPONENTS 452

The Coastal Environment 452

Inputs to the Coastal System 453

COASTAL SYSTEM ACTIONS 453

Tides 453

Tidal Power

Waves 456

Wave Refraction □ Tsunamis, or Seismic Sea Waves

Sea Level Changes 458

COASTAL SYSTEM OUTPUTS 459

Erosional Coastal Processes and Landforms 459

Depositional Coastal Processes and Landforms 460

Beaches □ Barrier Chains

Emergent and Submergent Coastlines 463

Emergent Coastlines □ Submergent Coastlines

Organic Processes: Coral Formations 465

Coral Reefs

Salt Marshes and Mangrove Swamps 467

HUMAN IMPACT ON COASTAL ENVIRONMENTS 468

Marco Island, Florida: An Example of Impact 469

SUMMARY 474

FOCUS STUDY 16–1: An Environmental Approach to Shoreline Planning 471