

BOOKS IN THE MACMILLAN EARTH SCIENCE SERIES

E. G. Ebbighausen: ASTRONOMY, Fifth Edition

Robert J. Foster: GEOLOGY, Sixth Edition

Robert J. Foster: HISTORICAL GEOLOGY

M. Grant Gross: OCEANOGRAPHY, Sixth Edition

N. Gary Lane: LIFE OF THE PAST, Second Edition

John C. Manning: APPLIED PRINCIPLES OF HYDROLOGY

Albert Miller and Richard A. Anthes: METEOROLOGY, Fifth Edition

ISBN 0-675-21355-X



1

How the Earth Works

Why Study Earth History? 1

Geology Is Simple—The Basic Laws of Geology 1

Geologic Time—The Age of the Earth 1

Uniformitarianism 2

Original Horizontality 3

Superposition 3

How the Earth Works 3

Internal Structure of the Earth 3

Internal vs. External Processes 6

The Mobile Earth—Internal Energy 6

Earth's Magnetic Field 11

Remanent Magnetism 14

Magnetic Stripes 16

Erosion—The Constant Surface Process 22

Extraterrestrial Effects 23

How Geologists Work 24

Recent Trends 25

2

Geologic Time—Dating Geologic Events

31

Relative and Absolute Dates 31

Geologic Time 32

Unconformities 35

Correlation and Dating of Rocks 39

Radiometric Dating 44

3

Reading the Rocks—Environment

53

Interpreting Geologic History 53

Interpreting Sedimentary Rocks 54

Features of Sedimentary Rocks 54

Deposition 57

Geosynclines and Plate Tectonics 64

Interpreting Sedimentary Rocks—Some Simple Examples 69

Interpreting Fossils 70

Isotopes and Environment 71

4

Evolution and Fossils

77

Evolution 77

Linnaeus—Species and Genus 77

Lamarck and Cuvier 78

Darwin 79

Mendel—The Laws of Inheritance 81

Punctuated Equilibrium vs. Gradualism 83

Patterns of Evolution 84

Divergence (Radiation) 84

Convergence 84

Extinction 84

Fossilization 88

5

Early History of the Earth—Astronomical Aspects

93

Private Lives of Stars—We Are Children of the Stars 93

Origin of the Solar System 94

Earth-Moon System	95
Solar System	97
Terrestrial Planets	97
Great Planets	112
Larger Moons of Jupiter and Saturn	113
Meteorites	116
Comets	118
Inferences and Speculations	119

6

The Precambrian—The Oldest Rocks and the First Life	125
Pregeologic History	125
Origin of Oceans and Atmosphere	127
Precambrian Rocks and History	129
Archean History	130
Early Proterozoic History	131
Late Proterozoic History	133
Origin of Life	135
The Oldest Fossils	136

7

Early Paleozoic—Cambrian, Ordovician, Silurian	149
Patterns in Earth History	149
World Geography in the Early Paleozoic	151
Late Precambrian to Early Ordovician	153
Interior	154
East	156
West	156
Far North	158
Middle Ordovician to Early Devonian	158
Interior	158
East	158
West	161
Far North	163
Life of the Early Paleozoic	163

8

Late Paleozoic—Devonian, Mississippian, Pennsylvanian, Permian

177

World Geography in the Late Paleozoic 177

Middle Devonian to Late Devonian 178

Interior 178

East 179

West 180

Far North 182

Latest Devonian to Late Mississippian 182

Interior 182

East 184

West 184

Far North 186

Latest Mississippian to Permian 186

Interior 186

East 189

West 190

Far North 194

Life of the Late Paleozoic 197

9

The Mesozoic—Triassic, Jurassic, Cretaceous

215

World Geography in the Mesozoic 215

Triassic of Western North America 216

Jurassic Through Cretaceous 220

West 220

Gulf and Atlantic Coasts 227

Far North 227

Life of the Mesozoic 228

10

The Cenozoic

255

World Geography in the Cenozoic 255

The Cenozoic 255

Atlantic and Gulf Coastal Plains 256

Appalachian Mountains 257

Rocky Mountains and High Plains 257

Colorado Plateau 261

Basin and Range	261
Northwestern United States	263
California Coast	265
Arctic	266
Pleistocene	266
Glacial Climate and Glacial (Pluvial) Lakes	271
Cause of Glaciation	272
Life of the Cenozoic	277
Human Fossils	282

Appendix A

Rocks 297

Rock Cycle 297

Igneous Rocks 297

Sedimentary Rocks 299

Clastic Sedimentary Rocks 299

Nonclastic Sedimentary Rocks 301

Metamorphic Rocks 303

Nonfoliated Metamorphic Rocks 304

Foliated Metamorphic Rocks 304

Appendix B

Topographic Maps 309

Topographic Maps 309

Map Scales 309

Contour Lines 310

Conventions Used on Topographic Maps 312

Colors 312

Appendix C

Geological Maps 314

Appendix D

Fossil-Forming Organisms 318

Glossary 333

Index 351