

THE HISTORICAL  
**ATLAS**  
OF THE  
**EARTH**  
A VISUAL EXPLORATION  
OF THE EARTH'S PHYSICAL PAST

ROGER OSBORNE  
AND  
DONALD TARLING

CONSULTANT EDITOR  
STEPHEN JAY GOULD

ADDITIONAL CONTRIBUTIONS BY  
G.A.L. JOHNSON  
UNIVERSITY OF DURHAM

VIKING

# Contents

	INTRODUCTION	10
<b>PART ONE: THE COSMOS</b>	Big Bang to Stellar Space <i>The birth of the universe</i>	18
	Meteorites, Asteroids and Comets <i>Clues to the origins of the Earth</i>	20
	Formation of the Planets <i>Solid worlds from solar nebula</i>	22
	The Moon <i>Earth's dead satellite</i>	24
	Motions in the Earth <i>The active forces beneath the crust</i>	26
	The Earth's Magnetic Field <i>The dynamo in the core</i>	28
<b>PART TWO: MAKING AND DATING THE EARTH</b>	The Making of the Continents <i>The beginnings of a solid crust</i>	32
	Atmosphere and Oceans <i>Earth's life support system</i>	34
	The Archean World <i>The Earth 4,000 to 2,500 million years ago</i>	36
	The Origins of Life <i>A chance combination</i>	38
	The Making of Rocks <i>Solid rock from sediment</i>	40
	The Proterozoic World <i>The Earth 2,500 to 550 million years ago</i>	42
	Early Life and the Fossil Record <i>Discovering the past in the present</i>	44
	Early Glaciations <i>The Earth cools and freezes</i>	46
<b>PART THREE: THE EARLY AND MIDDLE PALEOZOIC ERA</b>	Evolutionary Explosion <i>Early marine life of the Burgess Shale</i>	50
	The Cambrian World <i>The Earth 550 million to 500 million years ago</i>	52
	Shells and Skeletons <i>Guides to the history to life on Earth</i>	54

	The Ordovician World	56
	<i>The Earth 500 to 440 million years ago</i>	
	The Silurian World	58
	<i>The Earth 440 to 410 million years ago</i>	
	The Caledonian Mountains	60
	<i>Europe and North America in collision</i>	
	The Devonian World	62
	<i>The Earth 410 to 350 million years ago</i>	
	Life onto Land	64
	<i>Plants and animals move from sea to land</i>	
<b>PART FOUR:</b>	The Lower Carboniferous World	68
<b>THE LATE PALEOZOIC ERA</b>	<i>The Earth 350 to 315 million years ago</i>	
	Limestone	70
	<i>Chemical deposition of carbonates</i>	
	The Upper Carboniferous World	72
	<i>The Earth 315 to 290 million years ago</i>	
	The Great Swamp Forests	74
	<i>Coal from vegetation in Pennsylvania and Northern Europe</i>	
	The Appalachians	76
	<i>The shaping of North America</i>	
	Metals in the Earth	78
	<i>Sedimentary ores in the Mississippi valley</i>	
	The Permian World	80
	<i>The Earth 290 to 250 million years ago</i>	
	Gondwanaland Glaciations in the Permian	82
	<i>The ice ages of the Late Paleozoic</i>	
	Mass extinctions of Marine Life	84
	<i>The end of the Paleozoic era</i>	
	Europe and Asia Joined	86
	<i>The Ural Mountains and the Siberian Traps</i>	
<b>PART FIVE:</b>	The Triassic World	90
<b>THE MESOZOIC ERA</b>	<i>The Earth 250 to 210 million years ago</i>	
	Desert Sandstone	92
	<i>The northern continents turn hot and dry</i>	

Reptiles and Birds <i>Dominant animals of the Mesozoic</i>	94
The Jurassic World <i>The Earth 250 to 145 million years ago</i>	96
The Opening of the Central Atlantic <i>North America separates from Africa and South America</i>	98
Ammonites <i>Abundance and diversity</i>	100
Early Dinosaurs <i>Origins and development</i>	102
Arabian Oil <i>The world's largest concentration of mineral wealth</i>	104
The Cretaceous World <i>The Earth 145 to 65 million years ago</i>	106
Chalk <i>Warm, tranquil waters over northern Europe</i>	108
The Arctic Basin and Verkhoyansk Mountains <i>Ocean floor and oil-rich shelf seas</i>	110
Flowering Plants <i>Domination of the plant kingdom</i>	112
Cretaceous Dinosaurs <i>Dominance, isolation and decline</i>	114
South America splits from Africa <i>The opening of the South Atlantic</i>	116
The Caribbean Basin <i>A sea between two continents</i>	118
Mass Extinction of Mesozoic Life <i>From dinosaurs to mammals</i>	120
<b>PART SIX: THE TERTIARY ERA</b>	
The Tertiary World <i>The Earth 65 to 2 million years ago</i>	124
The Rise of Mammals <i>Development and spread of the dominant land animals</i>	126
The Cordilleran Orogeny and the Rocky Mountains <i>Uplift of western North America</i>	128
The Himalayas <i>India in collision with Asia</i>	130
Australasia <i>The long separation from Gondwanaland</i>	132

	Corals <i>Changing sea levels and reef-building</i>	134
	The Hawaiian Islands <i>A 'hot spot' on the Earth's crust</i>	136
	The Northern North Atlantic <i>From Iceland to the Arctic Basin</i>	138
	The Alps and the Mediterranean Basin <i>Africa and Arabia collide with Europe and Asia</i>	140
	The Andes <i>Mountain chains and metal ores</i>	142
	The Japanese Islands <i>Disturbance zones in the west Pacific</i>	144
	Flooding the Mediterranean <i>The last remnants of the Tethys Sea</i>	146
<b>PART SEVEN: ICE AGES AND THE FIRST HUMANS</b>	Ice Ages <i>The world turns colder</i>	150
	The Pleistocene World <i>The Earth 2 million years ago</i>	152
	The Great Lakes and the Mississippi Basin <i>Remnants of the ice ages</i>	154
	Human Origins and Migration <i>From Africa to every corner of the Earth</i>	156
<b>PART EIGHT: PRESENT AND FUTURE EARTH</b>	Mount St. Helens <i>Volcanoes in recent history</i>	160
	The San Andreas Fault <i>Plate margins in the present world</i>	162
	Earthquakes <i>Historical recordings of geological events</i>	164
	Antarctica <i>Ice movements on a continental scale</i>	166
	The Earth's Climate <i>Present trends and future changes</i>	168
	Future World <i>The Earth continues to change</i>	170
	Timelines	172
	Glossary	174
	Index	185
	Bibliography	191
	Acknowledgements	192