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The First Four Billion Years



Precambrian Time

Volcanoes bubbled and exploded, the atmosphere was poisonous, the oceans nearly froze over. Life evolved in a world very different from our own, and in so doing, transformed our planet. For nearly 90% of its history, life consisted of simple, single-celled organisms like bacteria and algae. We find them as fossils (really!), and they are responsible for making Earth inhabitable for the first animals. Evidence is found in peculiar rocks called banded iron formations...5

The Paleozoic Era



The Cambrian

From small, strange, soft-bodied creatures that lived on the seafloor, in a span of ten million years almost all the modern phyla with easily-preserved hard parts had evolved. Probably the others did too, but have not left a fossil record. This is called the 'Cambrian Explosion.' What can account for this sudden burst of evolution...or is it really an artifact of preservation? And why have no new archetypes arisen since then?...21



The Ordovician

The greatest radiation of animal families ever to take place occurred during the Ordovician Period. Although the basic body plans were already set, Nature took the opportunity to produce endless variations on these themes. Life was still restricted almost entirely to the marine realm, but there are tantalizing hints that plants may have begun their colonization of the land. And the Earth experienced a major episode of glaciation, wreaking havoc with the environment...37



The Silurian

The greening of the land began apace with the establishment on land of simple, moisture-loving plants like mosses and liverworts. In the marine realm, trilobites reigned supreme and were hunted by voracious, predatory nautiloid cephalopods and eurypterid 'sea scorpions.' North America occupied tropical latitudes, and the climate returned to a 'greenhouse' one...49



The Devonian

Fishes diversified into an enormous array of shapes and sizes, and the largest of them became fearsome predators. The first large trees appeared on land, and the earliest forests arrived on the scene, tempting some animals to leave the water in search of new habitats. A major extinction event occurred late in the Period, decimating marine invertebrates...61



The Mississippian

The world was warm, sea levels were high, and large areas of North America were covered by shallow waters. Coral-sponge reefs formed on the continental shelves and have left us huge deposits of marine limestone. Forests of crinoids — animals that looked like underwater flowers and have been nicknamed 'sea lillies' — grew everywhere, and in some places their fossils make up most of the rock...75



The Pennsylvanian

The waters receded from much of our continent, and vast swampy lowlands covered most of the land. Forests of fern, horsetail, and clubmoss trees grew everywhere; their remains form the coal deposits of the Appalachian region, and much of the world. Huge carnivorous amphibians lurked in vegetation-choked rivers and made forays onto land, perhaps to sun themselves after a good meal...87



The Permian

Truly dry-land-adapted animals became commonplace: the reptiles. No longer were they tied to water for their reproduction; their young could develop fully in a terrestrial environment, safe inside a shelled egg. Plants, too, invaded drier habitats, relying on seeds for reproduction instead of spores. Climates the world over were becoming more arid as all the continents assembled into a single supercontinent — Pangea, which brought with it extensive deserts and strong monsoons. The Permian, and the Paleozoic Era, ended with the greatest mass extinction of all time, which may have been caused by extensive volcanism and the sudden release of vast seafloor methane stores...103

The Mesozoic Era



The Triassic

Life rebounded from the end-Permian extinctions. The world was hot, dry, and unified: you could have walked from Greenland to Antarctica without getting your feet wet. 'Fish lizards' called ichthyosaurs swam in the oceans and hunted coiled ammonites. On the land, two very important groups of animals made their debut: the mammals and the dinosaurs...119



The Jurassic

The Jurassic was the "high noon" of the age of dinosaurs. Humongous, long-necked sauropods browsed on high conifer trees and low cycads; plated stegosaurus munched on ferns; and they were hunted by packs of carnivorous theropods. Birds took to the air, joining the leathery-winged reptiles called pterosaurs. Our ancestors skulked in the shadows, staying small...135



The Cretaceous

A great interior seaway connected the Gulf of Mexico with the Arctic Ocean, cutting North America in half. Ferocious plesiosaurs and mosasaurs plied the waters, devouring anything they could catch. Our continent broke away from Europe, Africa, and South America, allowing endemic dinosaur faunas to emerge. *T. rex*, the "tyrant king," hunted herds of hadrosaurs and ceratopsians. Flowering plants made their debut and began to edge out the seed plants with cones. Curtains came to the Cretaceous when a gigantic meteorite slammed into the Yucatán — but is that the whole story?...149

The Cenozoic Era



The Miocene

Grasslands spread across the interior of our continent as the rains became less reliable. Herds of horses and camels made use of this new forage. As they came to rely more and more on the abrasive grasses for food, their teeth began to change as well, becoming higher-crowned to survive a lifetime of wear. Rhinos browsed in the shadow of the Cascade volcanoes, which belched huge clouds of ash high into the North American skies, creating some amazing fossil bonebeds...201

(Chapter 16: The Pliocene)



The Pleistocene

Finally, the ice came. It crawled down from Greenland and Hudson Bay to cover our continent as far south as Ohio. Woolly mammoths grazed on lush grasses and forbs at the edge of the ice; mastodons browsed in spruce swamps across the Great Lakes region; sabertooth cats and packs of dire wolves hunted bison, pronghorn, and deer. Time and again the ice advanced and retreated. When last it melted, most of the large mammals vanished with it. Why? Was it related to the appearance of a new mammal on our continent — *Homo sapiens*?...225



The Holocene

North America's large mammal fauna is severely depauperate compared with what it has been in the past. Will the trend of extinctions — at our hand — continue? And the Ice Age is not over. We are merely living in an interglacial spell between inevitable advances of the ice. But paradoxically, our world is warming, and again we are responsible. Can we — and should we — try to stop it? What lessons can we learn from North America's past that might help us decide?...243