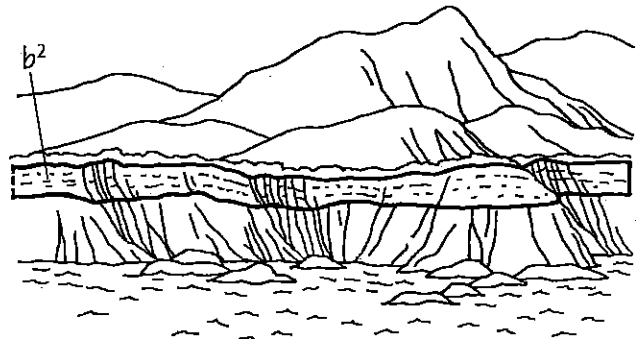


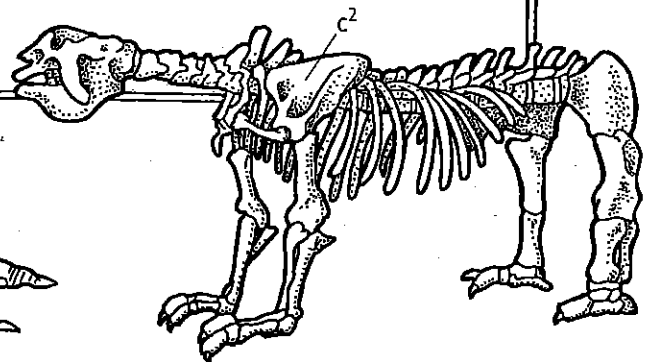
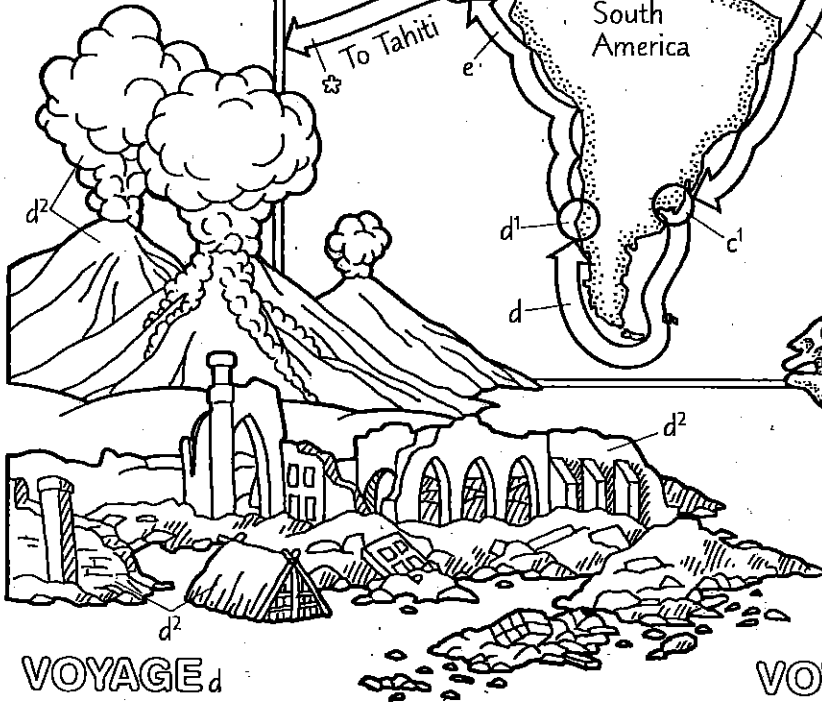
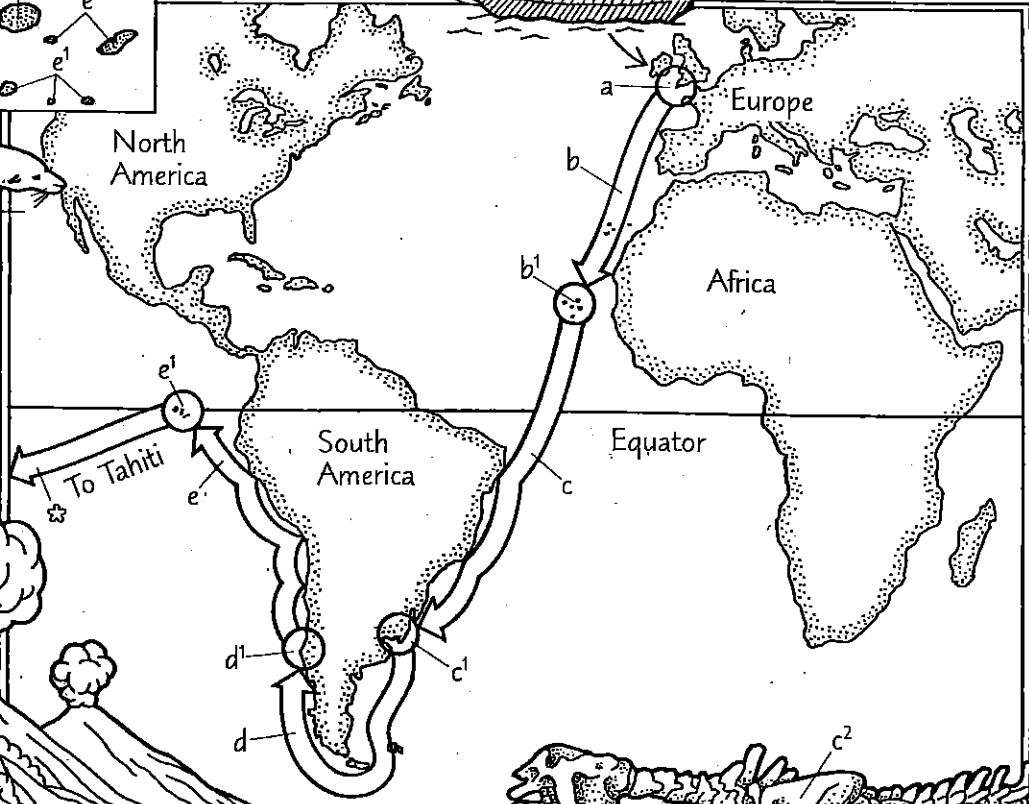
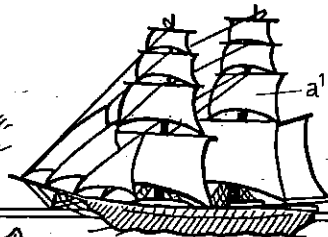
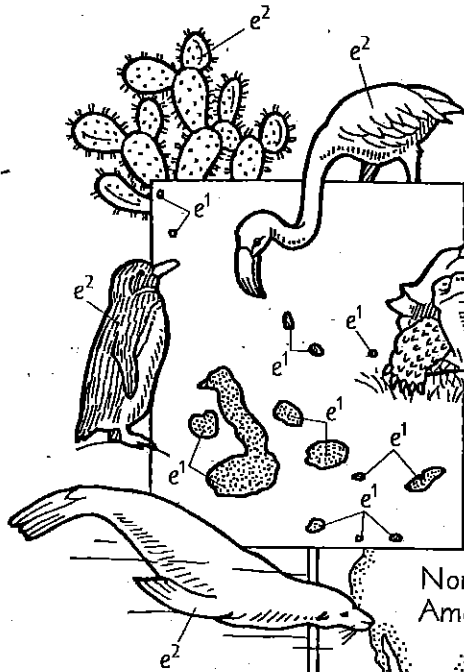
DARWIN'S VOYAGE

PLYMOUTH^a
HMS BEAGLE^{a1}

VOYAGE^e
GALÁPAGOS
ISLANDS^{e1}
BIOLOGICAL
DIVERSITY^{e2}



VOYAGE^b
CAPE VERDE
ISLANDS^{b1}
CORAL UPLIFT^{b2}



VOYAGE^d
CHILE^{d1}
EARTHQUAKE, VOLCANOS^{d2}

VOYAGE^c
ARGENTINA^{c1}
MEGATHERIUM^{c2}

1-1

MAPPING THE GLOBE: DARWIN'S VOYAGE

Charles Darwin transformed the way we view ourselves, our world, and the life forms which inhabit our planet. How did this naturalist come to revolutionize biology through his ideas on evolution and natural selection? Darwin's life as a scientist began when he took a position as naturalist and companion to Captain Robert FitzRoy aboard HMS *Beagle*, a ship charting the coastal waters of South America. As the ship circled the globe over a five year period (1831-1836), Darwin, not yet an evolutionist, puzzled over the diversity and distribution of life he observed.

Begin by coloring HMS *Beagle* and its departure from Plymouth, England, (a) and (a¹).

The ship covered great distances, encountered extensive coastlines, and called at innumerable islands and archipelagos. As he voyaged, Darwin came to appreciate "how infinitely small the proportion of dry land is to the water of this vast expanse." At every opportunity, Darwin went ashore, and he spent three of the five years traveling into high mountains, crossing the pampas, and exploring the rain forests. He studied rock formations, collected plants and animals, observed the composition of life in different habitats, and noted the effect of geographical barriers on species distribution. Observations and collections made during these travels laid the foundation for his life's work studying the natural world.

Next, color the voyage to the Cape Verde Islands in the Atlantic Ocean off the coast of West Africa (b) and (b¹). Color the illustration of coral uplift (b²).

HMS *Beagle* docked 23 days in the Cape Verde Islands and Darwin studied the geology extensively. He had read the newly published *Principles of Geology* (1830) by Charles Lyell, who explained that geological features were products of natural processes such as uplift, erosion, and sedimentation. The Cape Verde Islands were, for Darwin, a textbook case of the processes Lyell had described. Darwin observed that the layers of coral then exposed on the side of the island could have grown only in shallow waters, not above the surface of the water. He concluded that the coral deposits forming a white band in rock far above the present tide level therefore reflected earlier uplift from the sea and changes in the land surfaces due to volcanic activity. Early in his travels, Darwin became convinced of the newly emerging idea in geology that the earth is dynamic and changing, not static and fixed.

Next, color the voyage to Argentina (c) and (c¹). Color the fossil remains of *Megatherium* (c²).

Exploring the grassy pampas of Argentina, Darwin uncovered fossilized bones of animals now extinct: *Megatherium*, a giant

ground sloth; *Glyptodon*, a giant armadillo; and *Toxodon*, a strange animal resembling a hippopotamus. Darwin noticed that some extinct forms seemed to be giant relatives of living inhabitants of South America, whereas others had no living counterparts. Darwin sought to explain why some species suddenly disappeared and became extinct, whereas others were replaced by similar but modified living inhabitants.

Color the voyage around Cape Horn to Concepción, Chile, (d) and (d¹). Color the earthquake and volcanos as well (d²).

While exploring a forest in southern Chile, Darwin experienced the rocking of an earthquake and the "motion made me giddy." The earthquake had run for 640 kilometers along the coast and was accompanied by the eruption of a line of volcanos, which Darwin had witnessed while aboard the *Beagle*. When HMS *Beagle* stopped at Concepción, the epicenter of the earthquake, Darwin witnessed the havoc and destruction wrought on the town. He estimated that the sea coast had risen significantly above its previous level. These observations graphically demonstrated to him the physical reality of short, violent geological events causing major alterations in what seemed to be a stable earth.

Complete the plate by coloring the voyage to the Galápagos Islands on the equator 1000 kilometers west of Ecuador (e) and (e¹). Color the diverse life forms found on those islands (e²).

Toward the end of the voyage, the *Beagle* spent five weeks in the Galápagos Archipelago, a group of volcanic islands formed when lava welled up from the earth's interior through a hot spot in the earth's crust. The confluence of warm western surface currents with cold upwelling southern currents accommodated a curious mix of arctic and tropical species. Darwin was astonished at the penguins, fur seals, and sea lions, living side by side with flying fish, cacti, and tropical birds such as flamingos. Giant tortoises, from which the islands take their name, along with lizards and iguanas, thrived, but frogs and native mammals were absent. He wondered how this unusual combination of species ended up on these islands.

Darwin's observations on the diversity of plants and animals and their particular geographical distribution around the globe led him to question the assumption that species were immutable, established by a single act of creation. He reasoned that species, like the earth itself, were constantly changing. Life forms colonized new habitats and had to survive in new conditions. Over generations, they underwent transmutation into new forms. Many became extinct. The idea of evolution slowly began to take shape in Darwin's mind.