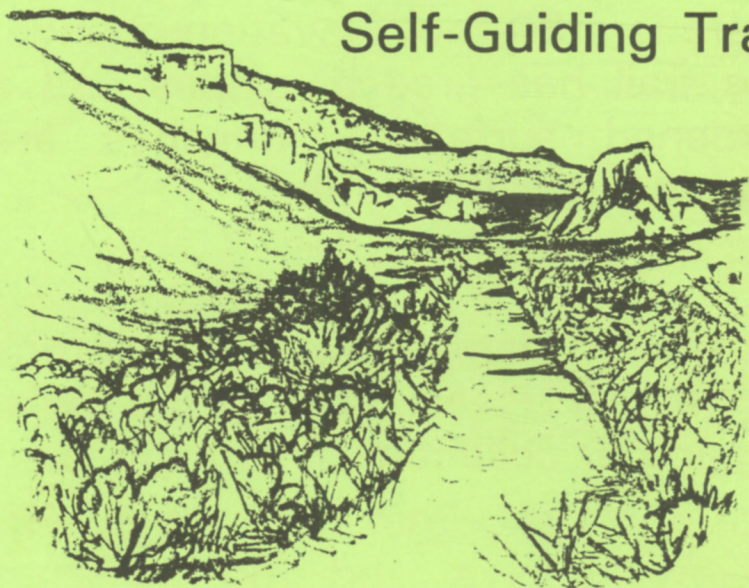


STORY IN STONE

Self-Guiding Trail



Fossils embedded in rock layers are like words on the pages of a book. With the discovery and study of each fossil a piece of a story is revealed and the image of an ancient environment develops. Your self-guided walk will take you near scenic rock formations. These same formations hold a fascinating story

... a story in stone.

The self-guiding trail, with four touchable exhibits, ends approximately 1000 feet from the start. There is a 30 foot elevation change. The trail has gradual slopes and a hardened surface. Benches are spaced along the route.

Foot traffic damages fossils and rock exposures. Please stay on the trails. Digging or collecting is prohibited.

Stop 1 ... The first stop is an exhibit display located 50 feet from the start of the trail. The rocks in this exhibit are from the neighboring slopes.

BASALT ... The top layers of the valley hills are dark, dense, iron-rich rock. They formed from lava floods occurring 16 to 15 million years ago. Each lava flow spread for miles, incinerating and burying the land.



Fossils are very rarely found in rock formed from hot lava or welded volcanic material.

CLAYSTONE ... Under the basalt flows are layers composed largely of volcanic ash deposited by air and water over a 15 million year period. These ash deposits, reworked by organisms, changed into clay-rich soils before they were buried and turned into rock. The claystone may be in shades of white, pale green,

red, or brown. The colors are due to various minerals undergoing chemical and structural changes after burial.

IGNIMBRITE ... Sandwiched in the claystone, just above the trees before you, is a layer of red and tan welded tuff, called ignimbrite. A violent eruption ejected hot gases, and volcanic materials, which traveled great distances across the land at high speed. This fiery torrent settled, the particles welding into hard rock. The layer has been dated as 29 million years old by measuring the decay of radioactive argon trapped within, a stone-bound clock.

BLUE BASIN TUFF ... Part of this layer, deposits of hot ash-fall, tops the pale green butte to the right. This tuff is hard, cemented together but not welded. It has been dated at 30 million years old.

STOP 2 ... This exhibit simulates fossils and rock in claystone. Find the 1/2 inch tall peg near the center of the exhibit. At ten o'clock from the peg, four adult finger widths away, is a fossil vertebrae. At six o'clock and three fingers away are mouse-deer teeth, about 1/2 inch wide. At two o'clock, three fingers away, is a snail shell about 1/2 inch in diameter. Other fossils to find are; vertebrae, teeth, and bone segments.



Fossils are fragile evidence of past life. Many fossils start as buried

bone, wood, shells, leaves, etc., that are then replaced by minerals found in ground water. Fossils also may be molds or imprints, such as footprints originally left in soft earth. The fossilization process can be interfered with by scavengers devouring bones, long exposure to air, incineration, erosion, and earth movements.

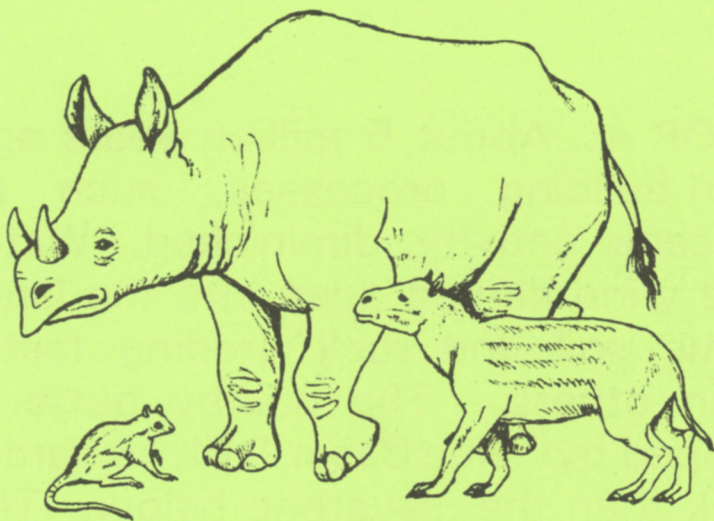
Fossils can be very large or microscopic. Large bones draw attention, but a single tooth can be used to identify a species, give clues to its diet, and reveal the age of the animal at its death. A pollen grain may reveal much about the parent plant. Root traces help suggest climates. Burrows and tracks can reveal animal behavior.

The trail crosses the wood foot bridge. Stop at the post numbered "3," at the first overlook.

STOP 3 ... Imagine a mouse eating into a book: the edges of the chewed pages revealing parts of letters and words, pieces of a story. Water acts as our mouse in the pale green rock below, the rains uncovering hidden fossils that park paleontologists seek. Knowing the exact layer a fossil is found, and its position within the layer, is vital in helping us read and understand the story of the past.

STOP 4...About 5 million years ago land-building processes, such as volcanic activity, diminished. Water and wind carved deep into the land, some soil and rock eroding faster than others. The nearby butte is capped by "Blue Basin Tuff," a harder rock than the claystone below. The cap still protects the butte, though eventually it and the butte will erode away. A layer of "Blue Basin Tuff" is also in the high cliff-side to the left.

STOP 5 ... These fossil replicas are a sample of over one hundred kinds of mammals discovered in the claystone. There are skeletal similarities between many mammals of various sizes, as evidenced by the display of mammal leg bone (femur) and tooth (molar) fossils. Though sizes vary, each animal was well adapted for their "role" in the environment.



Rodent

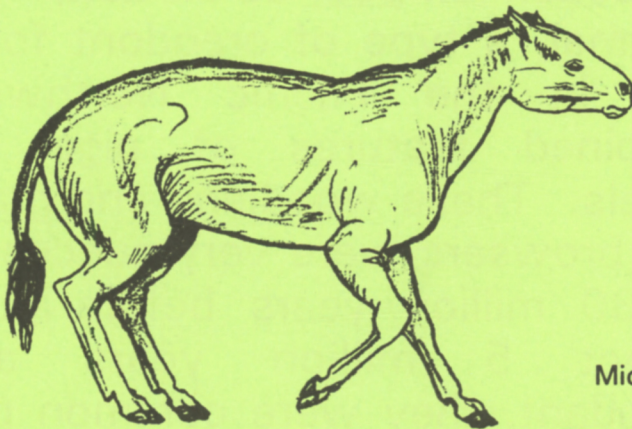
Rhinoceros

Oreodont

The upper femur and molar are from a **rhinoceros**, a lineage smaller than current rhinos having two horns on

the snout side by side. The middle elements are from a small **oreodont** (or-ee-oh-dawnt), a type of plant-eating mammal that no longer exists. Oreodonts weighed from 100-700 pounds. The lower femur and molar are from an adult **rodent**.

STOP 6 ... This exhibit has four replicas of fossil skulls, found in the claystone.



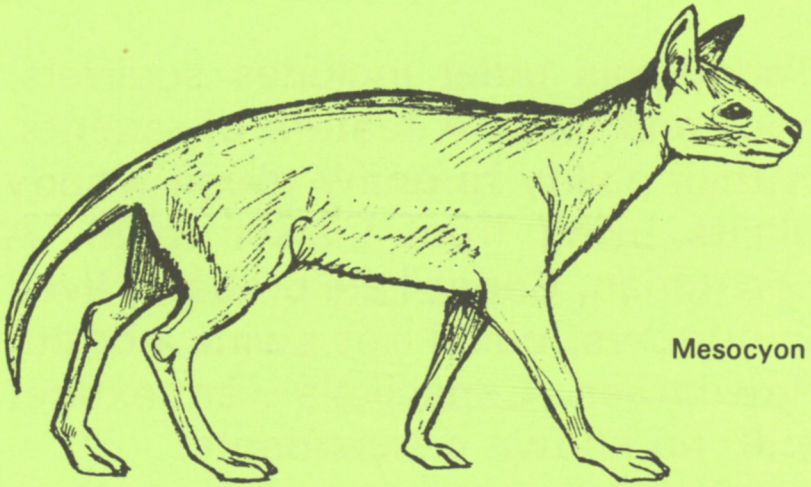
Miohippus

Miohippus (my-oh-hip-pus) - This three toed horse was the size of a small deer. It roamed forests feeding on leaves and eluding predators.

Grasslands gradually replaced some forests. To grind tough grasses teeth evolved, becoming longer and stronger, thus wearing longer. Over time, the skull lengthened and the eye socket would shift toward the rear as teeth extended deeper into the skull. Today's Equus, the larger, single toed horse, grazes the open range and races from danger.

Eporeodon (eh-pour-ee-oh-don) - This mammal, a type of oreodont found only in the Pacific Northwest, combined features of pigs and camels. These woodland and grassland browsers were very successful for 30 million years before going extinct 5 million years ago. Abundant, they were common prey to predators.

Mesocyon (mess-oh-sigh-on) - This short-faced mammal, with long neck, body, and legs, is a member of the dog family (Canidae).



Mesocyon

They had pointed teeth, meat-shearing teeth, and crushing molars, and could eat meat, bone, insects, and fruit. In the last 10 million years the number of canid groups has decreased by $\frac{2}{3}$, the domestic dog one of the remaining genera. Genus Mesocyon went extinct, with no evolved descendants known.

Capacikala (chap-ah-cheek-ah-la) - This beaver fossil was found in claystone above the ignimbrite layer that tops the nearby cliff. Beaver are a member of the rodent order.

Today this order includes squirrels, mice and rats. A feature of rodents is their ability to gnaw tough woody plants using front incisor teeth. A vegetarian, Capacikala probably lived in burrows, could not swim, nor cut down trees. Capacikala went extinct with no known descendants.

At the last stop on the trail you will find a bench that overlooks an eroded basin of land, to the east.

STOP 7 ... How much of the story in stone do we know so far? The claystone layers have revealed evidence of an ancient, changing environment. Average annual temperatures were warmer than present with less variation season to season. Rainfall was about 40 inches per year, compared to 15 today. The climate gradually became cooler, dryer.

At this spot, around 31 million years ago, you would be in a shallow, wide basin of forested land. Heavy thickets flourished beneath treetops made of maples, alders, "dawn" redwoods, elms, and beeches. There were a few clearings. For miles to the east, the land gently rose into the distance. Streams scored the forest floor, the water eventually flowing north. To the west, volcanic mountains reared up. The ancestral Cascade range grew, periodically erupting clouds of ash that fell like snow over the landscape. Plant and animal remains were gradually buried.

Beneath the treetops and amidst the undergrowth crept and blundered a splendid assortment of animals. Species of rodents, rhinoceros, oreodonts, monkeys, cat like nimravid, camels, giant pigs, deer-size horses, land snails, limbless lizards, and turtles abound. Birds peered down as hungry bear-dogs and sabertooth

"cats" hunted prey. The environment was rich in mammal diversity ... **more than the present.**

Many of these plant and animal species no longer exist. None of today's mammal species existed then. What insights, then, have we learned from this story in stone?

Changes in the environment will occur over time, such as climate, prey and predator, disease, and competitive changes. As a result, each living species is a mosaic of adaptations. Long-term survival of any species depends upon the potential to change, to adapt, perhaps giving rise to new species. The adaptation process is complex, and thousands of lifetimes may pass before bodily changes and abilities may evolve that enhance the survival of a lineage. Originations (new species) and extinctions are a significant part of evolution.



The ongoing study of geology and fossils at John Day Fossil Beds National Monument provides us clearer glimpses of our ancient environment, of familiar and unusual plants and animals. Other areas of the park reveal different chapters of the same story in stone. From near tropical forests of the Clarno Formation 50 million years ago, to the dryer and cooler grasslands of the Rattlesnake Formation just 6 million years ago, fossils are the evidence of evolutionary change.

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