Miracle Planet II: The Evolution of Our World
Violent Planet: Secrets of our Past

Earth was born as a result of repeated asteroid collisions, the moon created by a single giant impact event. Then, Earth's size attracted huge meteorites, which slammed into it, causing super-high-temperature rock vapor to cover the entire surface and evaporate all ocean water. The earliest life-forms survived such infernal events by escaping deep into the ground, miraculously emerging again and again.

The Earth has gone through innumerable catastrophic events, and life has survived by acquiring new abilities to live through each crisis. Humans are part of the grand history of life's evolution, which has been closely intertwined with repeated cataclysmic events. Why was Earth able to evolve into a livable planet, but not Mars, which failed to hold its atmosphere and oceans? Find out in the opening episode of the series.
Snowball Earth: First Complex Life

The hypothesis "Snowball Earth" explains that ice ages, caused by the earliest life-forms, resulted in an evolutional leap โ larger-sized life. Atmospheric methane created by microbes initially kept the Earth warm. As microbes that produce oxygen (photosynthesizers) emerged, atmospheric methane was lowered. As a result Earth cooled and the primeval ocean froze to 1,000 meters deep.

Most life may have become extinct during a long period of intense glaciation believed to have lasted several million years. However, some life survived, perhaps in puddles created near volcanic craters. Carbon dioxide accumulated in the air because thick ice sheets prevented ocean water from absorbing it. A green-house effect, created by carbon dioxide, finally melted the ice and fed photosynthesizers.

Hyper hurricanes raged after the great meltdown and stirred up the ocean water, creating an ideal condition for life to prosper and develop collagen. Using collagen, life-forms were able to build larger bodies, and a variety of creatures, called Ediacara biota, emerged for the first time.
New Frontiers: Onto the Land

Episode 3 tells the story of how "continental drift" brought our ancestors onto the land. Four hundred million years ago, shallow seas around primeval continents were home to most life-forms. The size of the shallow seas decreased as the supercontinents, like Laurasia formed. Some species found freshwater homes inland to escape from a struggle for survival in the ocean.

Continental drift caused the formation of huge mountains. The peaks blocked atmospheric currents, creating clouds that rain. The rain gathered to make rivers at the foot of the mountains. Our ancestor, Eustenopteron, came to live in those rivers at the foot of the Caledonian mountains, where primeval trees called Archaeopteris developed a mild and stable environment.

The leaves of Archaeopteris supplied nutrients for life, but caused oxygen depletion during dry seasons. Eustenopteron and other fish species developed proto-lungs to survive in low oxygen. Huge predators appeared as well. Acanthostega sought to hide from predators in Archaeopteris branches that piled in water near riverbanks. They made their way forward by pushing the branches aside, thus developing a forefoot. After several million years, Pederpes finally made the first step onto the land.
Extinction and Rebirth: Strategy of Life

Life on Earth has experienced five great extinctions. The worst occurred about 250 million years ago during the Permian period. Our ancestors at that time were mammal-like reptiles. The super-plume theory attempts to explain this extinction with a gigantic vertical flow of magma in Earth's mantle. About 300 million years ago, under the ocean trenches around the supercontinent Pangea, the end parts of the ocean plates dropped toward the core, creating a reactionary upward magmatic current that caused violent volcanic eruptions. A huge basaltic plateau in Siberia is believed to be evidence of this super-plume.

According to the theory, carbon dioxide from volcanoes warmed Earth, causing methane-hydrate long frozen under the ocean floor to melt. Enormous

amounts of methane were released into the air, accelerating global warming. The methane also depleted atmospheric oxygen, devastating plants.

The oxygen depletion continued for about 100 million years. Reptiles adapted best by developing a unique air-sac system. Mammals were also forced to devise a way to adapt, so they evolved to nurture babies in a womb in order to send them adequate oxygen. Mammals also devised a diaphragm for efficient respiration. This caused them to lose the lower half of their ribs, but as a result they could lie on the ground while twisting their waist. Now they were capable of breast-feeding.

Breakup: Survival of the Fittest

After the dinosaurs disappeared, the land was dominated by giant ground birds such as Diatrima. Continental drift, which had once caused the supercontinents to form, now broke up the huge landmasses. Mammals found an isolated niche for themselves in the Asian continent. Free from the attacks of giant birds, mammals could safely evolve there. In time, large, predatory mammals like Hyenodont emerged. When global warming melted the ice that had covered the land bridge between Asia and North America, a conflict erupted between Diatrima and Hyenodont. The winner was Hyenodont. It was the start of the golden age for mammals.

Primates still hid from their predators in treetops, where they developed a unique ability โ stereoscopic vision. Now that they could measure the distance between things, they could easily jump from branch to branch. As a result of global warming, trees grew higher and thick forests covered entire continents. Primates could live without going down to the ground, where dangerous predators roamed.

Then, as Antarctica was torn apart from other continents and became a world of ice and snow, it started cooling the entire Earth. Forests disappeared, and most of the primates became extinct. Anthropoids developed a fovea, part of the eye responsible for sharp vision, which enabled them to survive by efficiently finding food. Stronger eyesight brought about a side effect โ the ability to communicate through facial expressions. This led to the formation of a "society" among anthropoids.

Human Earth

Many types of hominids appeared and disappeared on Earth. Each environmental change created a different species of hominid, but only one species survived. Two million years ago at least four types of hominids existed. The drying out of the African continent is believed to be one reason different hominid species emerged.

Here again, continental drift was at work: It created the Himalayas. Towering peaks blocked the air current and created the monsoon climate. This brought rain to Asia, and dried the African terrain. Two types of early hominid flourished; small herbivores and tall flesh-eaters. Only the tall one survived.

The last two hominid species to exist simultaneously were Neanderthals and ourselves. Neanderthals had a brain almost the same size as that of present-day humans, but they became extinct 70,000 years ago. An analysis of their throat bone structure shows that they could not pronounce very clearly. Hence, their ability to communicate with language may have been weak. Early humans, however, could use language to share knowledge gained from their experiences. It was a key development on the road to civilization.

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