PLANET EARTH its origin and its destination

4.5 billion years ago th planets of the solar sy tem are being formed amongst them a glow ing, liquid "ball", which in time will solidify into our Earth. At this early stage the young plane s subjected to an incessant bombardm of meteorites and interplanetary debris, mak ing the development o even the simplest life forms impossible.



4.4 billion years ago

Age of Violence with huge impact craters.

In 4 billion years

Grand Finale

Ca. 4 billion years from now the Sun will expand to become a *red giant* before finally dying. After having been heated to some 1000°Celsius, the planet will drift through space, a cold rocky ball. Despite of its remarkable adaptability, Life (as we know it) will have disappeared from Earth, leaving nobody to witness a catastrophe of cosmic dimensions, i.e. the collision of our own Milky Way Galaxy with the neighbouring Andromeda Galaxy.. which will mean final destruction of Planet Earth and the solar system.

A dynamic entity, Earth's landmasses are constantly shifting, while oceans expand or shrink according to the prevailing climate. Because all these changes happen over millions of years - longer than the entire life span Homo sapiens - our planet, which forms our life support system, is generally regarded a stable environment, but nothing could be further from the truth. During its 4.5 billion year history continents have drifted together and broken up, accompanied by gigantic movements in the bowels of the Earth that caused mountains to rise and volcanoes to erupt, and the Africa we know today, at some future day once again may be part of one "supercontinent".

Evolution of Man

kg); 2 - Homo erectus leaves his birth place in Africa to settle the world; 3 - Homo heidelbergensis lives some 200 000 years ago in South Africa, and is believed to be the direct ancestor of modern man, **4** - Homo neanderthalensis, weighing one third more than Homo sapiens, becomes extinct for unknown reason; 5 - Homo sapiens emerges some 100 000 years ago. Namibia's Orange River Man' (above) roams the southern African plains about 50 000 years ago.

Today

Once more Earth is a pleasant place to live... for now! Still, even without Man's active "help", it is only a matter of time before the next catastrophe strikes, that again will leave behind a desolated Earth. Geologically speaking we are currently living in an interim period between ice ages, the last one having occurred some 10 000 years ago, and despite evidence of man-made global warming, scientists predict another worldwide cold period that will wipe out many of the life forms that populate our planet

Present



In 5 million years

Day after Tomorrow

Another great ice age having caused sea levels to fall, wide expanses of white, infertile salt flats are going to replace the present-day inland seas. Still, as so often before, Life will find a way and develop new forms adjusted to these less congenial living conditions, such as hypothetic salt lizards or wool rats (above), descendants of the hyrax as large as sheep, which are perfectly attuned to life on the European tundra. The average duration of higher life forms being considerably less than a million years, human beings probably will have evolved into another species distinct from Homo sapiens, if they have not become extinct.



First Rain

After the furnace-like conditions of its early years, Earth at last begins to cool down. As the temperature drops, water vapour condenses from the atmosphere and it rains... and rains... and rains! At first the Earth is still so hot that all rain water evaporates again immediately, but gradually the ground cools, and water starts to collect in immense basins, which in time will become the world's oceans.

4.3 billion years ago



More than half a billion years after its creation, the atmosphere on Earth is as thick as on Venus today, with dust particles from meteorite impacts obscuring the heavens. Separated from its parent planet during a collision with an asteroid or small planetoid, the Moon looms large in the sky at a distance of a mere 100 000 kilometres.

Although there are no oceans yet, the gravitational influence of the satellite causes the newly formed thin crust of cooling lava to rupture again and again, allowing fresh flows to pour out of the planet's interior. In the continuing struggle between constructive and destructive forces emerging landmasses are destroyed as soon as they are formed, and asteroids and meteorites crashing down upon Earth scar the young land







2 million years ago

1 - *Homo habilis* lives ca. 2 million years ago (1.5 m, 50



80 million years ago Before the Catastrophe Towards the end of the Cretaceous the dinosaurs have reached the peak of their development, among them the fearsome Tyrannosaurus *rex* - unaware that once again the end is near for much fo the life on Earth! In the undergrowth of the forests it roams for prey, a small night-active animal makes its



Spring

After the predominant dinosaurs have disappeared from the face of the Earth, either due to the asteroid impact at the end of the Cretaceous, or any of the reasons proposed by palaeobiologists, new species take their place in a once again hospitable environment. The first true mammals appear and proliferate to occupy the living areas of reptiles and amphibians, which dominated earlier periods.

50 million years ago



3.9 billion years ago

First life

Life on Earth finally starts in the depths of the newly formed oceans, where for the first time a hospitable environment is established. These early life forms are very simple single-celled organisms without a nucleus, which nevertheless are capable of using whatever nutrients are available (i.e. heavy metals, phosphorus, sulphur and methane) in the absence of oxygen - an early example for the determination of Life to persist! Some of these forerunners of Life as we know it (e.g. blue-green algae, bacteria) still exist today.





90 million years ago

Golden Age

The "Golden Age" of Earth continues during the Cretaceous. In the warm, but not too hot climate palms and gigantic ferns cover the land, forming wide spread rain forests and jungles. Insects and plants proliferate, while dinosaurs become the temporary "Kings of Creation", conquering land, water and air.





appearance, which is believed to be the predecessor of all mammals.



Impact

Another major extinction event strikes Earth at the beginning of the Cenozoic in the form of an asteroid. According to a widely accepted theory, the missile hits in the Caribbean region, leaving a 175 kilometre wide crater, now covered by the Gulf of Mexico, and causing another "nuclear" winter, with clouds of dust and ashes that obscure the sun, earthquakes and enormous fires. Evidence for this theory is thought to be the presence of iridium (a metal extremely rare on Earth) in rocks of the Cretaceous-Tertiary boundary layer.

65 million years ago

225 million years ago

Die-Off

Due to a disastrous climate change, some 95 per cent of all aquatic life and 75 per cent of all land animals become extinct at the end of the Permian, amongst them some predecessors of the dinosaurs. It is thought that a number of factors, among them enormous volcanic eruptions blocking off the sunlight, work together to effect a global warming, with a CO_2 -laden atmosphere and acid rain, that leaves Earth almost as barren and depopulated as in its first beginnings.







Landfall

the deep marine environment life begins to move into shallower waters, as conditions o the young Earth moderate. Tidal areas become experimental laboratories for temporary existence on dry land. Stromatolites, formed by primitive blue-green algae, adapt to these spe cialized conditions, and can still be found toda e.g. on the west coast of Australia

170 million years ago

Take-Off

As so often before after a catastrophic event, during the Jurassic Life bounces back stronger than ever. During one of the longest warm periods in the history of Earth, it not only recovers from the devastating decimation a few million years earlier, but in the prevailing congenial conditions, prospers to conquer new habitats. Pterosaurs, like the seven metre long *Pteranodon*, for the first time take to the air and thus become the predecessors of today's birds.



2.3 billion years ago

Frost

One of the earliest ice ages covers Earth with mighty glaciers. Palaeontologists speculate that the proliferation of Life has generated an increased demand for and con sumption of CO₂ (there still being no free oxygen in the atmosphere) which in turn caused a gradual decrease in temperature. From now on cold periods of varying length, severity and origin will recu at intervals during the following billions of years of Earth's history, but always Life will recover, once temperatures begin to rise again.



530 million years ago

Explosion of Life

570 - 500 million years ago, during the "Cambrian Explosion of Life" a multitude of new species develop to populate the oceans, when the development of free oxygen in the atmosphere yet again creates new living conditions. Trace fossils of the first multi-celled organisms have been found all over the world from Canada to Australia; although named "Ediacara" after the type locality in South Australia, the Nama fauna of southern Namibia (right) actually are the first known representatives of the new life forms, which become extinct at the end of the Cambrian.



360 million years ago

First Steps

With the development of densely vegetated swamp-like regions in the Devonian age, the scene is now set for the first amphibians to leave the ocean. But while they spend part of their life on land, to sleep, reproduce and hibernate, the members of this new phylum still return to their native element.



Dream Weather

During the Silurian period, Planet Earth knows mostly blue skies and mild to warm temperatures... ideal conditions for life to spread once more! No land forms have as yet developed, and Earth is still dominated by aquatic creatures. Amongst them trilobites (a group of animals that will become extinct before the age of the dinosaurs), show an especial zest for life, with thousands of different species, whose fossilized remains are used by modern-day palaeontologists to correlate rock strata from around the world.

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