A long, long time ago, Earth was born. About five billion years ago in fact, a new, living organism we call home emerged out of the clouds of debris and gas floating around the newborn star we call the Sun. To get a sense of the scale of Earth's history, imagine walking backwards in time and every step takes you a hundred years back. A mile takes you 175,000 years into the past...20 miles corresponds to more than 3 million years. But to even make a small dent in Earth's history, you would have to keep walking for many weeks. If you walked twenty miles for three weeks you would only go back 70 million years to just before the mass death of the dinosaurs. At a hundred years per footstep, you'd have to walk for almost three years to reach the dawn of life on our planet, and almost four years to arrive at earth's beginnings.

Earth was born as a sphere of rock and liquid metal some 8,000 miles in diameter. Like most of the collections of matter in the Universe, huge forces of gravity pulled particles together from a spirialing nebula into a spherical shape. The inward squeezing of those particles created explosive forces which pressed outward and kept the Earth from collapsing into nothingness. The delicate balance of pushing and pulling, between gravitation and explosive energy, allowed Earth to exist.

Other planets were also forming at the same time. However, they did not follow the same path as our Earth. Why is that? What is so different about Earth that our evolution as a planet continues long after other planets have stopped? What did Earth have that other planets did not? Nothing spectacular--only the proper size enabling a balance between gravity and explosive forces. Nothing extraordinary--just a position with exactly the right distance from the sun that enabled earth to establish a temperature range where life as we know it could form. Had this particular amount of stellar material not come together in such a size and at such a place, the solar system would probably have remained a lifeless place throughout its billions of years of existence.

Earth's first 500 million years were hellish in their intensity. The Earth was superheated to more than 3,600 degrees Fahrenheit. Gigantic explosions of volcanic activity made the surface a cauldron so hot that even rocks could not remain in a solid state. No life as we know it could exist. Sulfuric volcanic explosions, rivers of glowing lava and a steady bombardment of asteroids and comets disrupted the Earth's surface. The surface wasn't actually even solid. It was a bubbling magma ocean, glowing red and being pelted with glowing, molten rain at temperatures of thousands of degrees. That intense heat radiated out into the cold vacuum of space cooling the planet's outer shell.

The newborn Earth was also bombarded with meteors and asteroids the size of small planets, keeping her surface in constant turmoil. Finally, the collisions slowed enough to allow the planet to settle down. Thousands of volcanoes that had kept the surface of the planet in a liquid state of molten rock began to cool enough to allow a thin, solid crust to form on the surface. This crusty covering, like the shell of an egg, was as thin as three miles deep in some places.

Under the crust, the young earth was organizing itself into layers that increased in thickness the deeper they went. This organization led to the formation of all the layers of the Earth that we study today as well as the continents, the oceans, and the atmosphere. Beneath the crust formed an 1,800 mile thick mantle of molten rock and minerals, that could reach temperatures as high as 7,500 degrees Fahrenheit. Inside the mantle was a double core--a liquid section about 1,400 miles thick and solid section about 750 miles thick.

While the inside of the earth was organizing into layers, the surface and sky were still in turmoil. Many volcanoes from all over the Earth spewed hot nitrogen, carbon dioxide, noxious sulfur compounds, and water vapor into the thickening atmosphere at rates of billions of tons per day. This volcanic activity produced a covering of gases surrounding the planet that became the first atmosphere. It was not at all like the atmosphere we know today. The early atmosphere was mostly carbon dioxide with some hydrogen and nitrogen too. There was no oxygen at all.

After a few million more years of these processes, water vapor had become a principal component of the primordial atmosphere, forming a global storm of turbulent dark clouds, howling winds, shattering lightning, and constant torrential rain. Since the surface of Earth was still hot, the rains evaporated as soon as they hit the surface. After millions more years of this process, the surface of the crust cooled and hardened enough to allow water to collect into low lying basins which gradually filled forming the beginnings of our oceans. For a time, the young oceans created a global sauna as the thin layer of surface water penetrated cracks and fissures, contacted hot rocks below, and returned to the surface as giant geysers of roaring steam and superheated water. Such intense water-rock interactions served to cool the crust faster, making way for deeper ponds, then larger lakes, and eventually mighty oceans that covered nearly the entire surface of the planet.

By the time the earth was about 200 million years old--barely old at all--the surface had become a brilliant blue waterworld with a mile deep ocean encircling the planet.

Since the continents had not yet formed, the primordial blue ocean was broken only by isolated steaming volcanic islands that poked above the waves.

The surface of the earth continued to cool and slowly, the air changed from poisonous clouds of dying volcanoes to a mixture of new and friendlier gasses. Huge quantities of carbon dioxide were absorbed into the waters. By 3.5 billion years ago, carbon dioxide had been replaced by nitrogen as the dominant gas in the atmosphere. By 1.5 billion years ago, carbon dioxide had been reduced to just a small fraction of the atmosphere. Nitrogen's dominance grew, and oxygen had become a major component of the atmosphere.

As the outer crustal layers of basalt cooled and hardened, they formed a heat-trapping cover over the roiling mantle beneath. Basalt began to melt forming a new type of magma. This new magma was much less dense than magma made from basalt, and eventually pushed its way to the surface forming granite. The creation of granite allowed mountains to form on the crusty surface of Earth. Some of them grew from volcanic flows built up into cone shaped mountains. Some were pushed up from beneath the surface by rock layers pushing against other rock layers. Some of the pushing and shoving created peaks that rose miles into the air and long chains of mountain ridges that ran for thousands of miles. The folding and wrinkling of Earth's crust even occurred beneath the surface of the water where mountain ranges covered the floor of the oceans.

Because granite is less dense than other crustal materials, it gradually built up the surface of the crust and formed the beginnings of the continents, yet another important step in the differentiation of Earth from most other planets. As recently as 200 million years ago, there were still no continents as we know them now. There was only a single mass of rock that geologists named the supercontinent: Pangea. By about 135 million years ago, Pangea shifted, moved and broke into two big pieces that formed Laurasia to the north (including what is now North America, Europe and most of Asia) and Gondwanaland in the south (including what is now South America, Africa, India, Antarctica and Australia.) By 65 million years ago South America had separated and become a giant island, India drifted toward Asia and Oceania began to break apart from Antarctica heading toward the configuration of continents we know today. The familiar face of Earth that we know today took hundreds of millions of years to form.

The story of the Earth is a living story. Even before life as we know it emerged, the planet Earth was alive with energy. Today, Earth continues to change and evolve like

a living organism. Pools of molten rock break through the surface as new volcanoes and earthquakes caused by collisions of continental plates shake the ground so violently that man-made buildings tumble to the ground in pieces. Earth has always been and is still alive, moving and changing and creating itself anew each day.

Adapted from:
Children of the Universe by Michael and D'Neil Duffy
The Story of Earth by Robert M. Hazen
The Mystery of Life By Jan Paul Schutten
The Universe Story by Brian Swimme and Thomas Berry
The Earth Machine by Edmond A Mathez and James D Webster