

## Early Earth

The Earth has gone through a number of changes before it was ready to support the human race. There was a lot of heating, colliding, cooling, and repeating in the 2.45 billion years it took to create what us humans call home.

Before the first major collision the Earth was extremely hot due to three things radiation, accretion, and pressure. The Solar System, at this time, was a chaotic place and huge pieces of metal, rock, and ice were slamming into the Earth's surface leaving magma puddles. There was also no oxygen to breathe. There was, however, an atmosphere that was created by the release of water vapor and other gases from the collisions mentioned earlier. This eventually created a greenhouse effect, heating the planet some more. But the Earth did eventually cool, the magma hardened, and the steam that was in the atmosphere rained down to make chemical filled oceans. Then the cycle of heat repeated.

About 4.53 billion years ago the Earth changed. Something about the size of Mars collided with Earth and all of the molten rock that had cooled over those billions of years became magma again. This also caused all of the ocean water to vaporize and went back into the atmosphere. Debris also projected outward, causing a ring of matter that orbited the Earth, and later became the Moon. The surface of the Earth became hot again, causing the oceans to reform a steam atmosphere. Again, the Earth eventually cooled down and the oceans reformed. The Moon, which was formed by this time, took control over the Earth's tilt and climate.

Flash forward about 1 billion years and you are at a point in the Earth's history when the first organisms were consuming hydrogen gas and producing methane as a waste product and this affected the atmosphere by increasing the amount of methane in the atmosphere. Flash forward about another 1.5 billion years and stromatolites mounds populate the world's beaches. Early microbes used the sun's energy for photosynthesis, but didn't release oxygen. But by 2.8 billion years ago life forms evolved that could use sunlight water molecules and release oxygen as a waste product. These were they zano bacteria that still prosper in today's oceans. This boosted the amount of oxygen in the atmosphere and the organisms of the Earth evolved to thrive while others died out. The oxygen then form an ozone layer about 20 to 30 km above the ground, protecting live on the Earth's surface from the sun's harmful rays.

This boost of oxygen also meant a boost of methane and carbon dioxide, which are greenhouse gases. This caused the Earth to retain less of the Sun's heat, and the climate became much colder. The Earth effectively became a ball of ice; the ice then reflected more of the Sun's rays, making it even colder. Volcanoes then proceeded to come to the surface and carbon dioxide levels went up, causing the greenhouse effect to be stronger, causing the ice to melt. There were roughly about three cycles of 'Snowball Earth' between 4 to 2.2 billion years ago, followed by a billion years of a stable atmosphere.

This leads us to the current era, where there is an abundance of plant and animal life. 400 million years ago, vascular plants, with tissue for conducting water, photosynthesis' caused the oxygen levels in the atmosphere to rise. And by 300 million years ago extensive forests covered the planet, which pushed oxygen levels higher. This vast oxygen boost caused greater diversity of life biology, geology, astronomical material, and constant changes in the Earth's orbit. In conclusion, all of those cycles of heating and cooling were not for not.