

## Ocean 11

### Origins

Since the dawn of time, the oceans, which now cover nearly three-quarters of our planet, have played a major role in shaping the evolution of our planet. Even today, the oceans act like a great global steam engine, trapping the energy of the sun and swirling it across the globe in great currents of water. The waters of the globe pump heat and vapor into the atmosphere, creating clouds and storms, and causing the ice caps to advance and retreat.

The famous science fiction novelist, Arthur C. Clarke once remarked, "How inappropriate to call this planet Earth, when clearly it is Ocean."

71% of the Earth's surface is covered by the world's oceans.

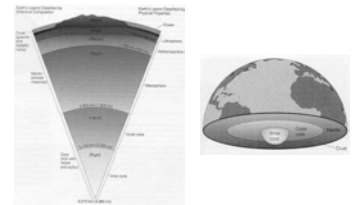
The total volume of water on the Earth, including glaciers, rivers, lakes, groundwater and atmospheric water, is 1,398,696,300 cubic kilometres.

This amount is approximately equivalent to 40 thousand billion billion cans of pop.

As the Earth formed, approximately 4.5 billion years ago, nuclear heating and the energy of thousands of collisions with smaller planet bits and meteorites caused it to become molten, at which time the core of the Earth differentiated into layers based on the density of materials within them.

As the Earth's core was differentiating, gases were released. These gases bubbled to the surface where they escaped to outer space (especially the lighter gases like helium and hydrogen) or were held by the forces of gravity to form our atmosphere.

This process was responsible for the release of gases from the interior of the earth that formed our early atmosphere.



In its initial stages, the Earth was too hot for an atmosphere to form. Any gases were superheated and released into space. However, once the Earth cooled sufficiently, after about 1 billion years, clouds began to form in the atmosphere, and the Earth entered a new phase of development. It began to rain. And it rained and it rained and it rained.

The formation of an atmosphere also protected the Earth from smaller meteorites, which burned up before they impacted the surface. The cloudy atmosphere also reflected some of the radiation from the sun, allowing the Earth to cool further. Eventually, the surface of the Earth solidified and the crustal plates were formed. After several hundred million years, the Earth finally had oceans, and atmosphere, and continents.

Other processes released gases and were responsible for bringing water to the Earth.

These include:

1. weathering by rainwater and sandstorms
2. release of gases by volcanoes or geothermal vents
3. photolysis - breaking apart of chemical bonds by light (radiation)
4. bombardment by meteorites (which have been shown to contain water)

However, these mechanisms alone could not account for all the water that we see on our planet.

After the earth cooled sufficiently, bombardment of the planets by meteorites brought water to the planet.

Meteorites continue to bombard our planet every day, although we mostly see them as "shooting stars" that burn up before they hit the Earth's surface.

Origin of life theories abound.

Perhaps life was seeded from outer space.

Perhaps life simmered beneath ice-capped primitive oceans.

Perhaps life began in the cauldrons of volcanoes or undersea hydrothermal vents.

One thing is for certain: No one has solved the mystery.

For life to endure, it must perpetuate itself.

It must figure out a way to keep itself going and pass its success on to the next generation.

And so that there can be a next generation, life also has to make copies of itself, copies that can adapt to changes in the environment, that can evolve.

The copies cannot be identical, cookie-cutter replicas. If life is to evolve, the replication process must be imperfect -- life must make mistakes. "The origin of life is the origin of evolution."

