

Lesson 5: Earth's Formation

Four and a half billion years ago, there was no Earth to stand on. Where our planet now travels through space, there was only a swirling cloud of gas and dust left over from the birth of the Sun. But gravity does not rest. Slowly, pieces of that cloud began to collide and stick together. Each collision added more material and released more heat. Over millions of years, this gradual piling-up of rock and dust, called **accretion**, built our planet piece by piece, like the universe rolling a snowball through space.

The young Earth looked nothing like the world we know. With every collision came heat, and there were so many collisions that the entire planet became **molten**: liquid rock glowing orange and red, with no solid surface anywhere. But inside that chaos, something important was happening. As Earth stayed liquid, the heaviest materials, mainly iron and nickel, sank toward the center, forming the dense **core**. Lighter rocks floated upward to form the **mantle**. The lightest materials of all rose to the very surface and eventually hardened into the thin outer layer we call the **crust**. Scientists call this sorting process **differentiation**, and it is why Earth is layered inside like a peach, with its thin skin, thick flesh, and hard center.

Over hundreds of millions of years, Earth slowly cooled. The surface hardened into rock. Volcanoes poured gases from deep inside the planet into the sky, beginning to build an atmosphere. Slowly, a world was taking shape: a planet with solid ground, layered depths, and just enough warmth from the Sun to make something extraordinary possible one day.

Earth was not handed to us finished and ready. It built itself from raw material left behind by our Sun's birth, assembled by gravity, shaped by heat, layered by time. Everything about our world today, its magnetic field, its volcanic mountains, its churning interior, its rocky crust, came from that long violent beginning. Out of fire and collision, the foundation of a living world was slowly, patiently laid.