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The Earth

The Earth is a rocky planet that orbits (travels around) the Sun. From space, the Earth looks blue. This is because 70 per cent of its surface is covered with water.

Unlike any other planet that we know, the Earth is home to millions of different kinds of living things.

The Earth from space, showing clouds and the continent of South America.

Moving through space

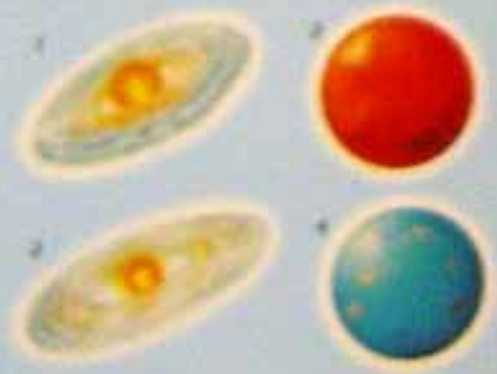
The Earth is constantly moving through space. It is about 150 million kilometres (93 million miles) from the Sun. The journey around the Sun takes a year – just over 365 days.

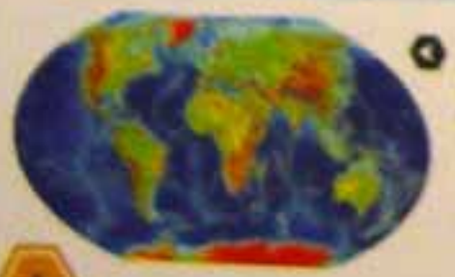
As it orbits, the Earth spins once each day. On the side of the Earth facing the Sun it is day. The side facing away from the Sun is in shadow, and it is night.

Formation of the Earth

The Sun, the Earth and other planets formed around 4.5 billion years ago from a cloud of dust and gas.

1. The Solar System (the Sun and the planets that orbit the Sun) began as a cloud of gas and dust.
2. Most of the gas and dust formed the Sun. Around the Sun the planets formed. One of these planets was the Earth.
3. At first, the Earth was so hot that its surface was always all molten (fluid).
4. Over time, the Earth cooled. An outer crust of hard rock formed. Water vapour in the air condensed (changed from a gas to a liquid) to form oceans.





This is what the Earth would look like without oceans hiding the ocean floor. There are high mountain ranges, deep valleys and flat plains both on the ocean floor and on the continents.

FIRST FACTS

Earth data

- Diameter at Equator: 12,756 km (7,926 miles)
- Average distance from Sun: 149 million km (93 million miles)
- Time taken to spin on axis: 24 hours
- Time taken to orbit Sun: one year

Seasons

The Earth is tilted on its axis (an imaginary line that passes between the poles). For half of the year, the North Pole leans towards the Sun. For the other half of the year, the South Pole leans towards the Sun. This tilt gives the Earth its seasons. It is summer in the part of the Earth tilted towards the Sun.

These lights in the atmosphere are seen in the far north and far south. They are caused by particles from the Sun exiting the Earth's atmosphere.

The life zone

The Earth is in just the right temperature for life to exist. It has liquid water on its surface and gases in the air. The air surrounding the Earth is called the atmosphere.

Animals need oxygen in the atmosphere to breathe and water to drink. Plants need water and carbon dioxide gas, which is also found in the atmosphere.

FIRST FACTS

The Earth's atmosphere contains

- Nitrogen: 78 per cent
- Oxygen: 21 per cent
- Argon: 0.93 per cent
- Carbon dioxide: 0.04 per cent

Inside the Earth

The Earth is made of five different layers – the atmosphere, crust, mantle, outer core and inner core.

1. The inner core is made mostly of iron. It is even hotter than the outer core. The weight of the rocks above pushes down on it. This makes the inner core solid instead of liquid.
2. The outer core is made of hot fluid iron. Scientists think that the iron liquid moves around slowly inside the core.
3. The mantle is made of solid rock. It is much hotter than the outer crust and the rocks are tightly packed.
4. The crust is the thin outer layer of the Earth. We live on the crust and the ocean floor is on it.
5. The atmosphere is the layer of gas surrounding the Earth.

Air

You are surrounded by gases. You can't see them, and you can't smell them. But you can feel them move in and out of your body as you breathe.

When the wind blows you can feel the gases brush against your skin. The mixture of gases is called air.

When the wind blows, the air can push along sailing boats.

The atmosphere

Air surrounds the Earth in a thick layer called the atmosphere. Air contains mostly nitrogen (78 per cent) and oxygen (21 per cent). It also contains smaller amounts of other gases, including carbon dioxide.

If the air inside a balloon is heated, it becomes less dense (more spaced out) than the surrounding air. This makes it rise and lift the balloon.

Air for living things

Humans and other animals need to breathe in oxygen to make their bodies work. Without oxygen we would die. We breathe out another gas, carbon dioxide.

Plants need carbon dioxide. They use carbon dioxide, water and the power of the Sun to make their own food. As they do so, they give out oxygen.

Air pressure

The atmosphere is hundreds of kilometres thick. This means that there is a lot of air pressing down on us. At sea level, there is a force of about 1 kilogram (2.2 pounds) pressing on every square centimetre (0.2 square inches) of your body. This force is called air pressure.

At sea level, the weight of air is about 1 kilogram (2.2 pounds) for every square centimetre (0.2 square inches). As you go higher in the atmosphere, the air pressure gets lower.

Rocks and geology

Rocks are all around you. They are the natural, solid parts of the Earth. You can see rocks at the coast, on cliff faces and in the ground.

Most rocks are made of substances called minerals. Some rocks are made of plants and animals that died millions of years ago. Geology is the study of rocks and the structure of the Earth.

FAST FACTS

- There are more than 2,500 types of mineral
- Gold, silver, quartz, diamonds and rubies are minerals

Granite forms deep underground when hot, fluid rocks cool and harden. It is an igneous rock.

Sandstone is a sedimentary rock. It is made of small grains of sand that settled and have been squashed together.

Igneous rock

Igneous rock forms when hot molten rock from inside the Earth cools and becomes solid. Granite and basalt are igneous rocks.

Sedimentary rock

Sedimentary rock forms from sediments (tiny pieces of rock). Sediments are carried by rivers and eventually settle on the sea floor.

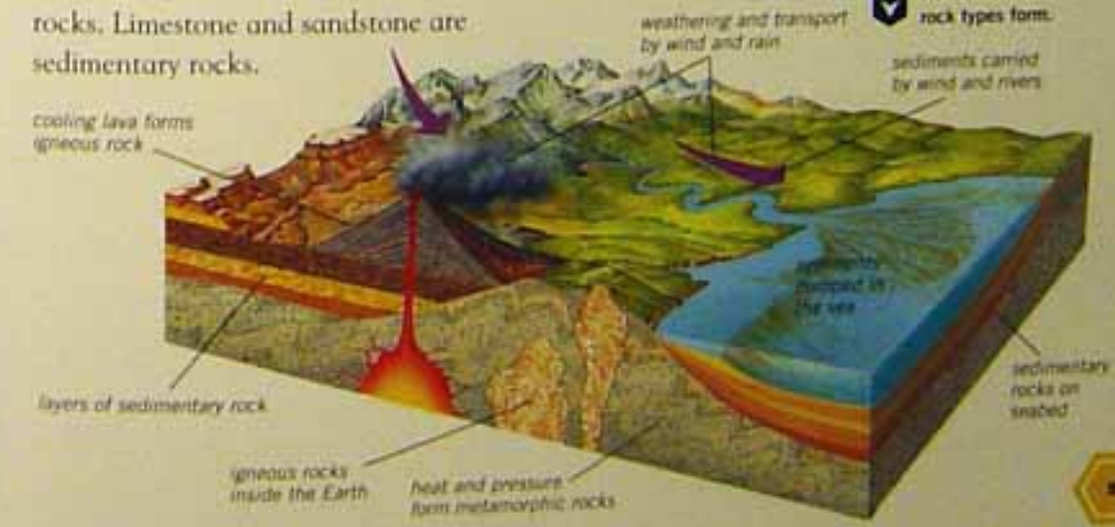
Over millions of years they are squashed by more layers of sediment. They become rocks. Limestone and sandstone are sedimentary rocks.

Metamorphic rock

Sometimes, igneous and sedimentary rock heat up under great pressure. They change into metamorphic rock.

When limestone is squashed underground where it is hot, it forms a metamorphic rock called marble.

How different rock types form.



Learning from rocks

People who study rocks are called geologists. Geologists use clues from rocks to learn about the Earth's history.

To a geologist, a piece of sandstone is not just a rock. It is part of an ancient beach or desert. Its sand particles were once part of a mountain. The sandstone might contain the bones of an extinct animal, or it could have imprints of an ancient plant.

BIOGRAPHY

James Hutton (1726–97) is called the 'father of modern geology'. In his time most people thought that the Earth was only 6,000 years old. Hutton studied how rocks were destroyed by wind and rain. He thought about how new rocks were created. He decided that the Earth must be millions of years old – now we know he was right!

Detective work

A geologist is a bit like a detective. They look closely at rivers and rock formations. They study minerals under a microscope. They gather evidence and use it to form ideas about how the Earth formed. They also try to find out how the Earth may change in the future.

DID YOU KNOW?

Rocks tell us what a place was like millions of years ago. They show us what the weather was like, which animals and plants were alive, and whether it was desert or swamp, land or sea, mountains or plains.

What do geologists do?

Geologists:

- study volcanoes so that they can predict eruptions.
- look for important minerals like copper and gold.
- make sure rocks are stable enough to build on.
- look for water underground.
- study rocks to find out how the Earth formed.

This geologist is studying a recent lava flow from a volcano.

Fossils

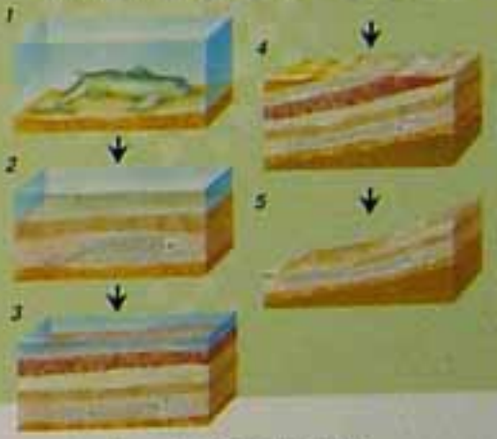
Fossils are the preserved remains of living things that died millions of years ago. There are many kinds of fossil. Some fossils formed from live plants or animals, such as a woolly mammoth's skeleton. Other fossils are signs of living things that were once alive, such as dinosaur tracks or leaf prints.

The fossil of an ammonite, nearly 200 million years old. Ammonites were shelled sea creatures that became extinct at the same time as the dinosaurs.

Fossil formation

It usually takes thousands or millions of years for a fossil to form. Here you can see how a sea creature becomes a fossil.

1. The creature dies and settles to the sea floor.
2. It is covered by sediments (particles of mud and sand). The flesh rots away, but the skeleton remains.
3. The sediments harden to form rock. The skeleton gets squashed and broken.
4. Earth movements lift up the rock layers. The sea level drops.
5. Wind and rain wears away the rocks. The fossil of the skeleton is revealed.



DID YOU KNOW?

In CE 79, Mount Vesuvius exploded. Hot ash buried the city of Pompeii in Italy. People and their animals burned. Imprints of their bodies were left in the ash. In hours, thousands of people became fossils preserved in rock.

The victims of the eruption of Mount Vesuvius formed fossils.

Fossils tell a story

Fossils show us what life was like on Earth in prehistoric times. They show us which animals and plants were alive. They can also show us what the ground was made of at different times in the Earth's history.