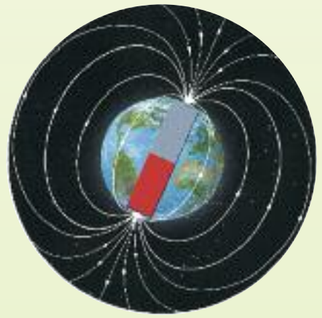
Contents



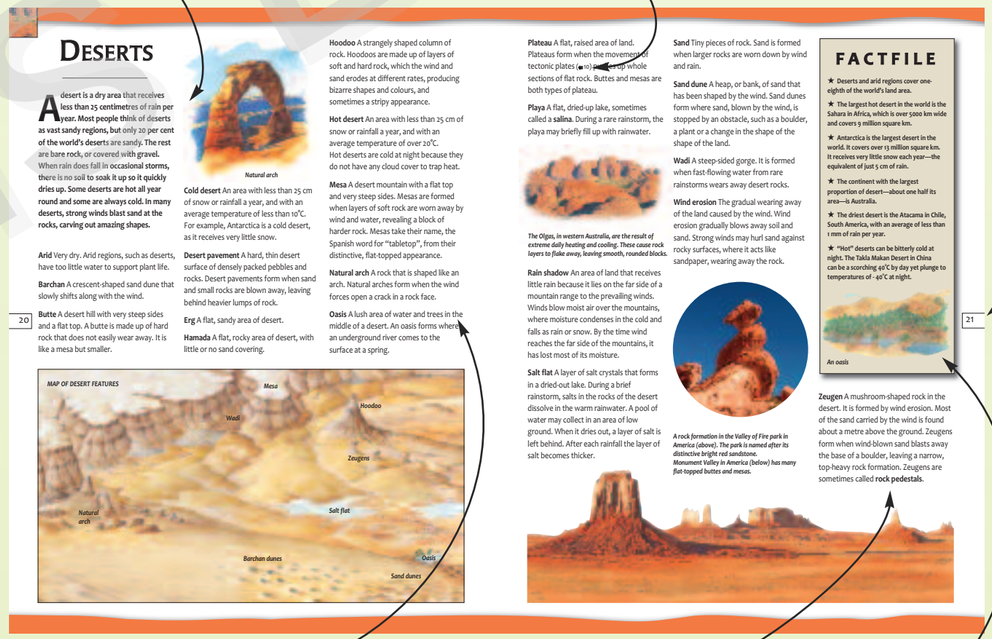
About this book

Each double page contains a brief introduction, explaining the general subject, followed by key words arranged in alphabetical order. To look up a specific word, turn to the index at the back of this book: this will tell you which page to go to. If you want to learn more about a subject, take a look at the factfile, or follow the arrows to read related entries.

INTRODUCTION
This explains the general subject and provides some basic knowledge.

ARROWS
These arrows show you where to look up other words mentioned in the entry. For example, (➡26) tells you to go forward to page 26 and (⬅6) tells you to turn back to page 6.

PAGE NUMBER
Page numbers are easy to find at the side of the page.



Deserts

A desert is a dry area that receives less than 25 centimetres of rain per year. Most people think of deserts as vast sandy regions, but only 20 per cent of the world's deserts are sandy. The rest are bare rock, or covered with gravel. When rain does fall in occasional storms, there is no soil to soak it up so it quickly dries up. Some deserts are hot all year round and some are always cold. In many deserts, strong winds blast sand at the rocks, carving out amazing shapes.

Arid Very dry. Arid regions, such as deserts, have too little water to support plant life.

Barchan A crescent-shaped sand dune that slowly shifts along with the wind.

Butte A desert hill with very steep sides and a flat top. A butte is made up of hard rock that does not easily wear away. It is like a mesa but smaller.

Natural arch

Cold desert An area with less than 25 cm of snow or rainfall a year, and with an average temperature of less than 10°C. For example, Antarctica is a cold desert, as it receives very little snow.

Desert pavement A hard, thin desert surface of densely packed pebbles and rocks. Desert pavements form when sand and small rocks are blown away, leaving behind heavier lumps of rock.

Erg A flat, sandy area of desert.

Hamada A flat, rocky area of desert, with little or no sand covering.

Hoodoo A strangely shaped column of rock. Hoodoos are made up of layers of soft and hard rock, which the wind and sand erodes at different rates, producing bizarre shapes and colours, and sometimes a stripy appearance.

Hot desert An area with less than 25 cm of snow or rainfall a year, and with an average temperature of over 20°C. Hot deserts are cold at night because they do not have any cloud cover to trap heat.

Mesa A desert mountain with a flat top and very steep sides. Mesas are formed when layers of soft rock are worn away by wind and water, revealing a block of harder rock. Mesas take their name, the Spanish word for "tabletop", from their distinctive, flat-topped appearance.

Natural arch A rock that is shaped like an arch. Natural arches form when the wind forces open a crack in a rock face.

Oasis A lush area of water and trees in the middle of a desert. An oasis forms where an underground river comes to the surface at a spring.

MAP OF DESERT FEATURES

Mesa
Hoodoo
Wadi
Zeugens
Natural arch
Salt flat
Barchan dunes
Oasis
Sand dunes

Plateau A flat, raised area of land. Plateaus form when the movement of tectonic plates (➡10) pushes up whole sections of flat rock. Buttes and mesas are both types of plateau.

Playa A flat, dried-up lake, sometimes called a **salina**. During a rare rainstorm, the playa may briefly fill up with rainwater.

The Olgas, in western Australia, are the result of extreme daily heating and cooling. These cause rock layers to flake away, leaving smooth, rounded blocks.

Rain shadow An area of land that receives little rain because it lies on the far side of a mountain range to the prevailing winds. Winds blow moist air over the mountains, where moisture condenses in the cold and falls as rain or snow. By the time wind reaches the far side of the mountains, it has lost most of its moisture.

Salt flat A layer of salt crystals that forms in a dried-out lake. During a brief rainstorm, salts in the rocks of the desert dissolve in the warm rainwater. A pool of water may collect in an area of low ground. When it dries out, a layer of salt is left behind. After each rainfall the layer of salt becomes thicker.

Sand Tiny pieces of rock. Sand is formed when larger rocks are worn down by wind and rain.

Sand dune A heap, or bank, of sand that has been shaped by the wind. Sand dunes form where sand, blown by the wind, is stopped by an obstacle, such as a boulder, a plant or a change in the shape of the shape of the land.

Wadi A steep-sided gorge. It is formed when fast-flowing water from rare rainstorms wears away desert rocks.

Wind erosion The gradual wearing away of the land caused by the wind. Wind erosion gradually blows away soil and sand. Strong winds may hurl sand against rocky surfaces, where it acts like sandpaper, wearing away the rock.

A rock formation in the Valley of Fire park in America (above). The park is named after its distinctive bright red sandstone. Monument Valley in America (below) has many flat-topped buttes and mesas.

Zeugen A mushroom-shaped rock in the desert. It is formed by wind erosion. Most of the sand carried by the wind is found about a metre above the ground. Zeugens form when wind-blown sand blasts away the base of a boulder, leaving a narrow, top-heavy rock formation. Zeugens are sometimes called **rock pedestals**.

FACTFILE

★ Deserts and arid regions cover one-eighth of the world's land area.

★ The largest hot desert in the world is the Sahara in Africa, which is over 5000 km wide and covers 9 million square km.

★ Antarctica is the largest desert in the world. It covers over 13 million square km. It receives very little snow each year—the equivalent of just 5 cm of rain.

★ The continent with the largest proportion of desert—about one half its area—is Australia.

★ The driest desert is the Atacama in Chile, South America, with an average of less than 1 mm of rain per year.

★ "Hot" deserts can be bitterly cold at night. The Takla Makan Desert in China can be a scorching 40°C by day yet plunge to temperatures of -40°C at night.

An oasis

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KEY WORDS AND ENTRIES
Key words are arranged alphabetically across each double page. Each entry provides a short explanation of what the key word means.

BOLD WORDS
These highlight useful words that do not have their own entry.

FACTFILE
The factfile provides extra information on the subject. Facts are presented in easy to read bullet points.

PLANET EARTH

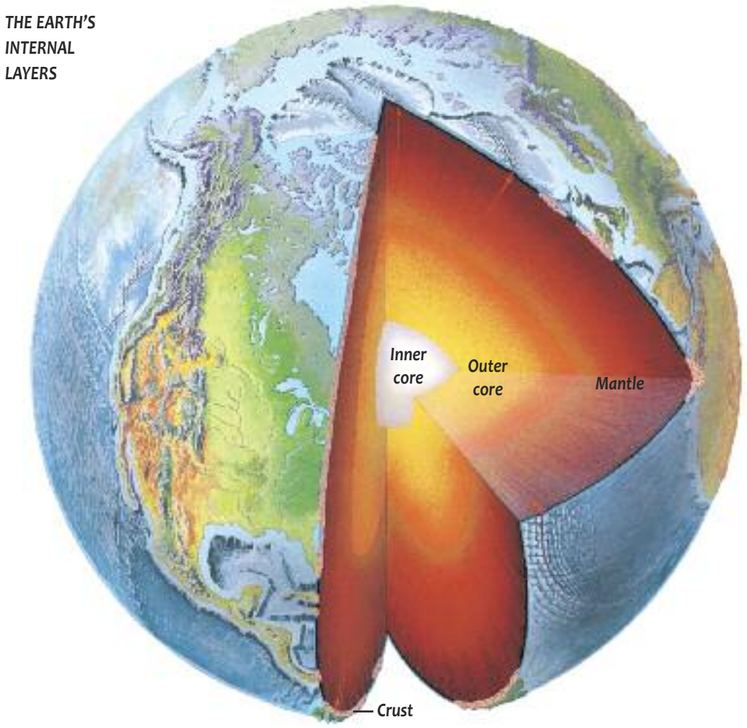
The Earth is a spinning ball of rock and metal. It is one of eight planets that orbit, or circle, our nearest star, the Sun. Its surface is made up of oceans and landmasses called continents. A layer of air called the atmosphere (➡28) surrounds the whole planet. The Earth's outer layer, the crust, is a thin, rocky shell. Beneath the crust lies the mantle, a thick layer made of hot, dense rock. At the very centre of the Earth is its core, a ball of metal, liquid on the outside, solid on the inside.

Asthenosphere A soft layer in the Earth's upper mantle. It lies just beneath the lithosphere. It is partly molten and allows the lithosphere to slide about over it.

Aurora The display of coloured lights seen in the night skies close to the Earth's magnetic poles. It occurs when high-energy particles from the Sun are trapped by the Earth's magnetic field.

Axis An imaginary straight line that runs North to South through the centre of the Earth. The Earth rotates, or spins, on its axis.

THE EARTH'S INTERNAL LAYERS



Continent One of the seven large landmasses on the Earth. They also include the continental shelf (➡22), an area that extends beyond the seashore.

Convection current The movement of heat through liquids and gases. Heated from below, a liquid or gas will expand, become less dense, and rise. Away from the source of heat, it will cool down and sink. Convection currents in the Earth's mantle are responsible for continental drift (➡10).

Core The innermost part of the Earth, mostly made of iron with a little nickel. It is divided into the outer and inner core.

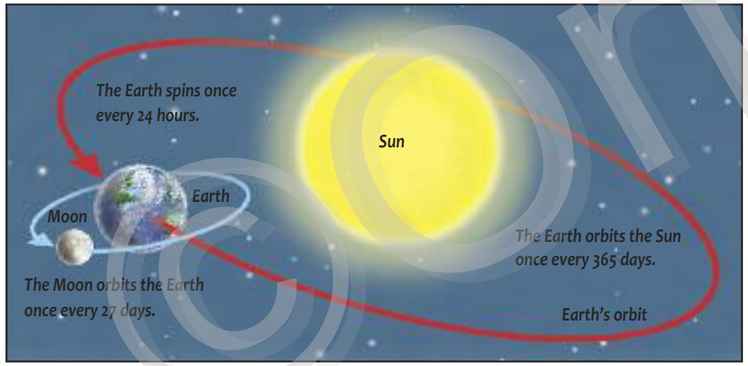
Crust The thin, rocky outer layer of the Earth. There are two main types of crust: continental crust and oceanic crust. Continental crust is between 35 and 70 km thick. Oceanic crust is only 5 to 10 km thick.

Inner core The very innermost part of the Earth. The inner core is a solid ball of the metal iron, about 2500 km in diameter. It is under so much pressure that it is solid even at temperatures of 5430°C.

Lithosphere A layer of the Earth made up of its crust, plus a thin layer of the upper mantle. It is split into large pieces called lithospheric, or tectonic, plates (➡11). These slide about on top of the asthenosphere.

Lower mantle The inner layer of the Earth's mantle. It is about 2300 km thick. The pressure exerted by the layers above prevents the rock from melting.

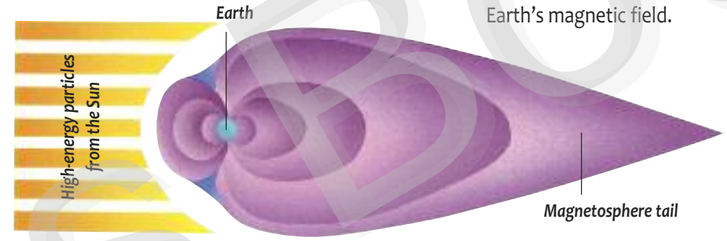
The orbits of the Earth and Moon



Magnetic field The region surrounding a magnet, an object which has two poles and a force of attraction between them. The Earth has its own magnetic field, which stretches into space and protects it from the Sun's high-energy particles.

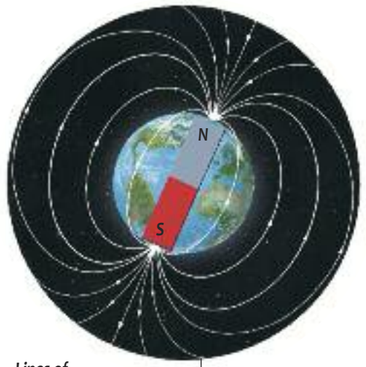
Magnetic poles The two points at either end of a magnet, where its force is at its strongest. The Earth's magnetic poles are located close to the geographical north and south poles. These are the two points where the Earth's axis meets the surface of the Earth.

THE MAGNETOSPHERE



Magnetosphere The region around the Earth in which its magnetic field exerts a force. The magnetosphere stretches thousands of kilometres into space and protects us from the Sun's high-energy particles, known as the solar wind. The solar wind "blows" the magnetosphere into a teardrop shape.

THE EARTH'S MAGNETIC FIELD



Mantle The rocky layer of the Earth that lies between the crust and the core. It is made up of the upper and lower mantle.

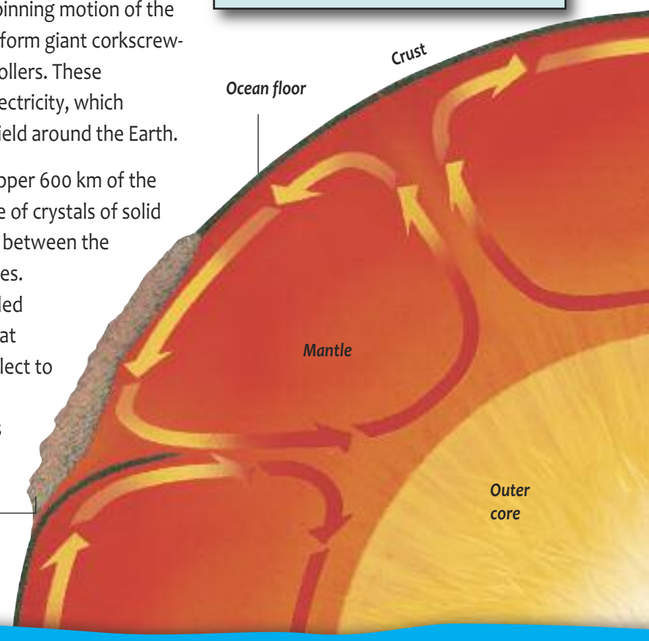
Moho (Mohorovičić discontinuity) The boundary between the Earth's crust and mantle. It is recognized because of the way it affects the movement of seismic waves travelling through the Earth (➡11).

Outer core The outer layer of the Earth's core. It is 2200 km thick and made up mostly of molten iron. Temperatures here rise to more than 4000°C. The liquid outer core spins around the solid inner core as the Earth rotates. This movement, known as rollers, is probably the cause of the Earth's magnetic field.

Rollers The twisting movement of liquid iron inside the Earth's outer core. Convection currents in the core cause liquid metal to swirl around. The currents are twisted by the spinning motion of the Earth's rotation and form giant corkscrew-like patterns called rollers. These movements make electricity, which creates a magnetic field around the Earth.

Upper mantle The upper 600 km of the Earth's mantle, made of crystals of solid rock with liquid rock between the crystals in some places. The molten rock, called magma, is under great pressure and can collect to burst out of holes or cracks in the crust as volcanoes (➡12).

CONVECTION CURRENTS IN THE EARTH



The aurora borealis, or Northern Lights, light up the skies of the Northern hemisphere (➡28).

FACTFILE

Diameter: 12,756 km
Day: 23 hours 56 minutes
Average distance from the Sun: 149.7 million km
Surface temperature: -70°C to +55°C
Atmosphere: nitrogen, oxygen, water vapour

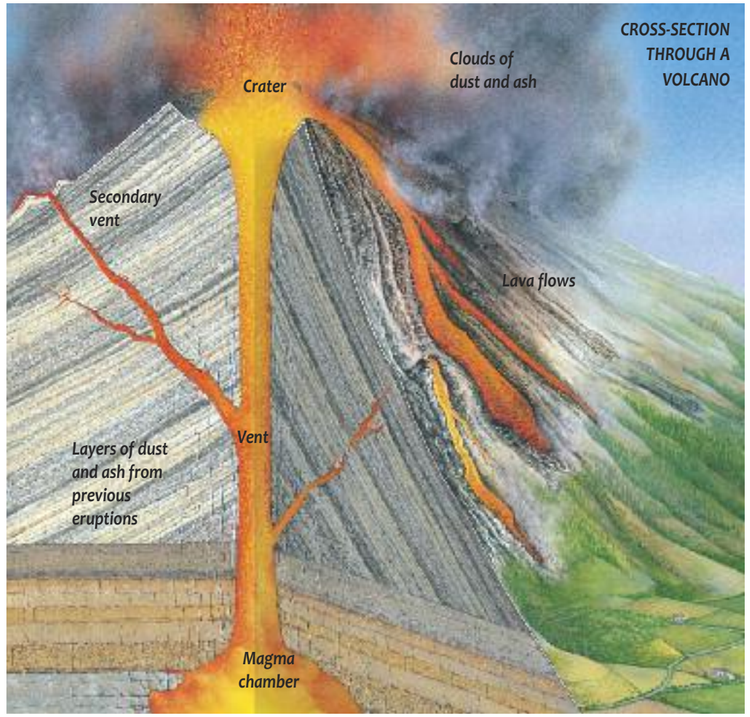
★ The Earth is about 4.5 billion years old.

★ The Earth is not a true sphere, but is a slightly squashed shape called an oblate spheroid. The distance around the Earth's equator is slightly greater than the distance around the Earth from pole to pole. This is caused by the spinning motion of the Earth pushing its mass out around the equator.

★ The deepest anyone has ever drilled down into the Earth is 15 km.

VOLCANOES

A volcano is an opening, or vent, in the Earth's crust through which magma, molten rock, erupts. The word volcano is usually used to describe a cone-shaped mountain with a central vent and a crater at the summit, but this is not always the case. Many volcanoes have gently spreading slopes. Others are simply cracks in the ocean bed. Most volcanoes are situated along the edges of the giant plates that make up the Earth's surface. More than half of the world's active volcanoes above sea level encircle the Pacific Ocean to form the so-called "Ring of Fire".



Aa Lava that carries lumps of solid rock called **clinker**.

Ash Lava that has been blown to powder by the force of an eruption. Ash clouds can reach up to 40 km into the sky.

Caldera A large, deep hole formed when a volcano collapses in on itself after a violent eruption.

Crater A circular, funnel-shaped opening at the summit of a volcano.

Dormant volcano A volcano that has stopped erupting, but which may burst into life again in the future. Mount St. Helens in the USA was a dormant volcano that came back to life spectacularly in 1980.

Fast-moving, runny lava flows are characteristic of volcanoes that erupt frequently and comparatively gently.

Eruption As pressure in the magma beneath the Earth's crust builds up, it forces its way up through cracks and erupts at the surface as lava. If the magma is quite runny, the gas contained in it can escape easily. The lava oozes out of the opening and flows down the sides of the volcano. If the magma is thick and sticky, the gas cannot escape, but builds up until it explodes. Huge clouds of gases and ash fly high up into the air.

Extinct volcano A volcano that has not erupted for tens of thousands of years.

Fissure A large crack or opening in the Earth's crust. Lava may emerge through a fissure without an explosive eruption. Undersea volcanoes are fissures in the seabed.

Geyser A natural fountain of hot water or steam that periodically ejects from an opening in the Earth's crust. Geysers erupt when underground water comes into close contact with hot, volcanic rocks.

Hot spot A weakness in the Earth's crust where magma is liable to force its way through. Over time, solidified lava builds up and may eventually break the surface of the ocean. The Hawaiian Islands, for example, are the summits of volcanoes rising from the floor of the Pacific Ocean.

Rock churches carved out of soft, volcanic rock in Cappadocia in southern Turkey.

Lava Magma that has erupted at the Earth's surface through volcanoes. It may flow as hot, molten rock for a while, but then quickly cools and solidifies. Lavas vary from thick to runny, according to the amount of gas contained within them and the type of silicates they are made of.

Magma chamber An underground pool of magma. Over time, pressure in the chamber builds up, forcing magma to push through cracks in the Earth's crust. Many volcanoes are situated above a magma chamber.

Magma Hot, molten rock beneath the Earth's surface. Magma is formed in the Earth's mantle. It is composed mostly of silicates, with gases contained in bubbles.

Pahoehoe Very runny lava that flows beneath a hardening, rocky crust. On cooling, it has a smooth, billowy texture and rope-like appearance.

A geyser erupts

Pillow lava Runny lava that erupts under the sea and hardens into round, pillow-shaped lumps of rock.

Pumice A volcanic glass "froth" formed from cooling, gassy lava. It contains numerous bubbles.

Pyroclastic flow The extremely hot mixture of volcanic rock and gases that sweeps down a volcano's slopes at more than 300 km/h, destroying everything in its path. The residents of Pompeii were wiped out by a pyroclastic flow when Mt Vesuvius erupted in AD 79.

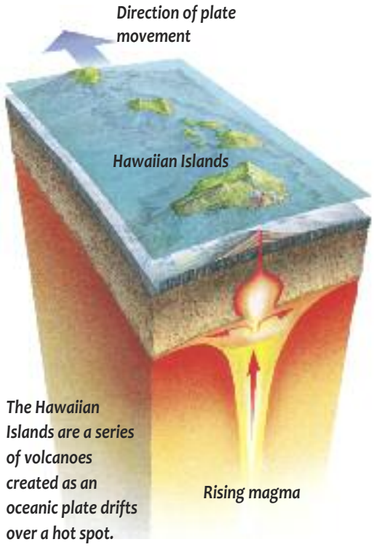
A close-up of ash shows that it is made of pieces of pumice.

Undersea volcanoes on the mid-oceanic ridge

Ring of Fire An area surrounding the Pacific Ocean where large numbers of earthquakes and volcanic eruptions occur. There are about 452 volcanoes in the Ring of Fire.

Shield volcano A large volcano with gently sloping sides. Shield volcanoes build up over time from repeated lava flows. They erupt thin, runny lava.

Silicates Types of mineral (➡17) that contain silicon and oxygen. Silicates make up more than 90% of the rocks in the Earth's crust. Thin, runny magmas consist of different types of silicates to those that make up thick, viscous magmas.



The Hawaiian Islands are a series of volcanoes created as an oceanic plate drifts over a hot spot.

Stratovolcano A tall, steep, cone-shaped volcano. Stratovolcanoes are formed from layers of volcanic lava, built up by multiple eruptions over hundreds of thousands of years. They erupt ash, pumice and thick, viscuous lava. Stratovolcanoes are the most common type of volcano.

Tuff A type of rock made of volcanic ash welded together. It was used by the Romans to make many buildings and bridges, and by the natives of Easter Island to make their famous statues.

FACTFILE

★ **The eruption in Tambora, Indonesia in 1815 killed about 92,000 people. The huge volume of ash in the atmosphere cooled the world climate for more than a year. It was called "the year without a summer".**

★ **The world "volcano" comes from the Italian island of Vulcano. Centuries ago, people believed that it was the chimney of the forge of Vulcan, the Roman god of life.**

★ **There are at least 1500 active volcanoes above sea level around the world. Indonesia has the most: 86 have erupted in its history.**

★ **One in 10 people live within "danger range" of a volcano.**

★ **Volcanic ash forms very fertile soil, so plants grow quickly after an eruption.**

★ **More than 80% of the Earth's surface is volcanic in origin. The ocean floor was formed entirely by lava from volcanic eruptions.**

★ **In 1943 a Mexican farmer watched an eruption in his field. He came back the next morning to find a volcanic cone 10 m high. It erupted repeatedly: after one year, the cone had grown to 336 m.**

Vent An opening in the Earth's surface through which lava and gases seep out.

Viscosity A measure of the fluidity of magma and lava (and other liquids). Thick lava is more viscous than thin, runny lava.