CONSTANT CHANGE OF THE EARTH’S SURFACE CURRICULUM

It may seem like the Earth is made up of one big solid rock, but it's really made up of a number of parts. Some of them constantly moving!

You can think of the Earth as being made up of a number of layers, sort of like an onion. These layers get more and more dense the closer to the center of the earth you get. .Earth is **composed of four main layers** – inner core, outer core, mantle, and crust.

(Show picture of four main layers)

**Crust**

The crust is the thin outer layer of the Earth where we live. Well, it looks thin on the picture and it is thin relative to the other layers, but don't worry, we're not going to fall through by accident anytime soon. The crust varies from around 3 miles thick (in the ocean floor) to around 43 miles thick (on land where we live called the continental crust). The continental crust is made up of rocks that consist primarily of silica and alumina called the "sial".

**Mantle**
The next layer of the Earth is called the mantle. The mantle is much thicker than the crust at almost 1,864 miles deep. It's made up of slightly different silicate rocks with more magnesium and iron.

**Tectonic plates**
The tectonic plates are a combination of the crust and the outer mantle, also called the lithosphere. These plates move very slowly, around a couple of inches a year. Where the plates touch each other is called a fault. When the plates move and the boundaries bump up against each other it can cause an [earthquake](https://www.ducksters.com/science/earthquakes.php).

 **Outer Core**

The Earth's outer core is made up of [iron](https://www.ducksters.com/science/chemistry/iron.php) and [nickel](https://www.ducksters.com/science/chemistry/nickel.php) and is very hot (4400 to 5000+ degrees C or 7,952 to over 9,000 degrees Fahrenheit). This is so hot that the iron and nickel metals are liquid! The outer core is very important to earth as it creates something called a magnetic field. The magnetic field the outer core creates goes way out in to space and makes a protective barrier around the earth that shields us from the sun's damaging solar wind.

**Inner Core**

The Earth's inner core is made up of iron and nickel, just like the outer core, however, the inner core is different. The inner core is so deep within the earth that it's under immense [pressure](https://www.ducksters.com/science/physics/pressure.php). So much pressure that, even though it is so hot, it is solid. The inner core is the hottest part of the Earth, and, at over 5000 degrees C,(9,032 degrees Fahrenheit) is about as hot as the surface of the sun.

**What causes earth surface changes?**

Changes can originate from below the surface and are caused by earthquakes and volcanoes. The surface of the Earth can also be changed by an impact from outer space, such as from a meteor strike. Most commonly, however, the changes to Earth's surface are due to weathering and erosion.

**Weathering**breaks down the Earth’s surface into smaller pieces. Those pieces are moved in a process called **erosion**, and **deposited**somewhere else. Weathering can be caused by wind, water, ice, plants, gravity, and changes in temperature.

For as long as the Earth has existed, weathering has helped shape the landscape. Weathering wears away rocks and soil.

Water is often the main cause of weathering, either as rain or ice. Rainwater can easily enter cracks in rocks or sidewalks. If this happens during cold months, the water may freeze and expand in the crack. Working as a wedge, the ice splits the rock. Many times, road crews have to patch up potholes caused by weathering from ice.

Wind can also cause weathering. Over long periods of time, wind can wear away rock and carry tiny pieces of the rock to new places. This is can create amazing landscapes, such as rocks that look like mushrooms.

Sometimes living things can cause weathering. Plant roots can wedge their way in between small cracks in rocks. As the plant grows, the roots increase the size of the crack little by little. Eventually, pieces of the rocks break off and get carried away by wind or water.

As pieces of the Earth are broken down by weathering, they are carried away in a process called erosion.

Water is a common way that pieces of the Earth are moved to a new location. Wind also contributes to erosion by blowing the particles away. Glaciers can pick up pieces of the Earth and drag them to new locations. They are slow but powerful.

Although erosion has helped shape some of the most amazing features on Earth, it can be harmful to the environment. When soil is washed away from one place to another, it can carry harmful materials like chemical, fertilizers, or pesticides. These dangerous chemicals can pollute our water supply.

It is important to remember that when weathering happens, tiny pieces of the Earth do not disappear. They are moved through erosion, and deposited somewhere else through deposition. It could be very close, only a few feet away, or it can be many miles away such as if the tiny pieces were washed into a river.

The deposited materials can also create new landforms. For example, in Hawaii black sand from eroded lava is deposited on several beaches.

We see the effects of weathering and erosion every day. Splits in roads or sidewalks are caused by the expansion of ice, or the daily heating and cooling of the ground.

Sand on the beach is created from ocean waves pounding on rocks and eventually creating sand.

Sometimes erosion can happen very quickly like with mudslides. Mudslides are caused by moving water and gravity, and happen in only minutes.

Most weathering, however, is a slow process that happens over thousands of years. The speed at which weathering and erosion take place depends on the type of material that is being worn away. Some hard rock, like granite, wears away slowly, while softer rock like limestone, wears away much more quickly.



Interesting Facts about the earth:

* Because of the presence of inner Nickel-Iron core, **Earth has a strong magnetic field.** This magnetic field is also responsible for preventing heavy solar winds from blowing on the Earth and causing damage to various life forms.
* **Earth’s inner core has a temperature between 5400 and 6000 degrees Celsius.** Thus, making it hotter than the surface of the Sun (surface temperature – 5500 Celsius).
* The **thickest of all the four layers of the earth is the mantle,** which is 2900 kilometers thick. This layer has a consistency of caramel and is composed of a hot mixture of molten rock.
* The **thinnest of all the layers is the crust,** which is on an average 30 kilometers deep on an average on the ground.
* Earth **does not have many craters** (less than 200) on the surface as the other planets have.
* The Earth also has the credit of being **the densest planet in the Solar System.** It has an average density of 5.51 grams per cubic centimeter.
* Earth is **the only planet** in the solar system that has [tectonic plates](https://pubs.usgs.gov/gip/dynamic/tectonic.html)underneath its surface. These plates are floating on top of the magma inside of the Earth. When these plates collide, earthquakes happen. Movement of these plates is also very important for other geological and life-supporting purposes.
* The diameter of Earth from the North Pole to the South Pole is shorter than its diameter across the Equator by 27 miles. Thus, **Earth is not a perfect sphere** and this difference in the diameter is the results of Earth’s rotation.
* Earth’s [core](https://phys.org/news/2017-01-silicon-element-earth-core.html)is almost 85-88% **iron** and its [crust](http://hyperphysics.phy-astr.gsu.edu/hbase/Tables/elabund.html)is almost 47% **Oxygen**.
* Earth is also known as the **“Blue Planet”** because of its bluish appearance from the outer space. Almost 70% of Earth’s surface is covered with water.
* Almost **70% of the earth’s surface is covered by oceans** that contain 97% of the planet’s water. These oceans are home to great mysteries and tons of geographical features that are not even available on the land. E.g. Earth’s longest mountain range is also underwater.
* **The highest point:** The peak of Ecuador’s Mount Chimborazo, located just one degree south of the Equator is the highest point on Earth. At this point, the[Earth’s bulge is greatest.](http://oceanservice.noaa.gov/facts/highestpoint.html)
* **The deepest known place:**“Challenger deep” – near a trench called the “Mariana Trench” beneath the surface of the Pacific Ocean to the southeast of Japan — is the deepest known place on Earth. This trench is [nearly seven miles](http://wonderopolis.org/wonder/where-is-the-deepest-place-on-earth) deep.
* The highest [recorded](http://www.guinnessworldrecords.com/world-records/highest-recorded-temperature)**temperature**: it is 56.7°C (134°F), measured on 10 July 1913 at Greenland Ranch, **Death Valley,** California, USA
* **The coldest permanently inhabited place:** Oymyakon, a village in Siberia, Russia, is where the [temperature](http://www.guinnessworldrecords.com/world-records/lowest-temperature-inhabited)reached -68 degree Celsius (-154 Fahrenheit). And the coldest temperature ever recorded on Earth was at Antarctica’s Vostok station – minus 89.2 degree Celsius (-192 degrees Fahreheit).
* **Wettest place:** Mawsynram in Meghalaya, India is the [wettest place](http://www.bbc.com/earth/story/20150827-the-wettest-place-on-earth) on land on Earth. It receives an average annual rainfall of 467 inches. This place is just 10 miles away from the town of Cherrapunji (another record holder for the wettest month and year ever.)
* **Driest place:** Dry Valleys in Antarctica is the [driest place](https://www.universetoday.com/15031/driest-place-on-earth/) on Earth. It receives no rainfall. This is a 2983 square mile region with no ice, snow or water.
* **Flattest country:** the [Maldives](https://thefactfile.org/maldives-facts/) is the [flattest country](http://www.guinnessworldrecords.com/world-records/flattest-country/) in the world with an average highest above sea level of 8 feet.
* The Nile is **the longest river on Earth** that extends 4,160 miles from its source in Burundi to the Mediterranean sea. However, Amazon is the biggest river in the world in terms of the water that flows down it.
* **Unknown minerals:** scientists have recently calculated that there are more than 1500 minerals that are still undiscovered in the Earth. We are aware of more than 5000 minerals but many are still unknown. Another captivating fact here is that the Earth’s mineral diversity is unique to itself and is [not duplicated](https://www.seeker.com/earth-has-more-than-1500-yet-undiscovered-minerals-1770180549.html)on any other planet, not even the [rocky exoplanets](https://www.nasa.gov/press-release/nasas-spitzer-confirms-closest-rocky-exoplanet/).
* **Carbon-di-oxide spitting lakes:** there are [three crater lakes](http://www.globalchange.umich.edu/globalchange1/current/lectures/kling/killer_lakes/killer_lakes.html) – Nyos, Monoun, and Kivu, that sit in Cameroon and on the border of Rwanda and the Democratic Republic of Congo. These lakes spit carbon dioxide at an enormous level and have been the cause of deaths of hundreds of people in the past. This phenomenon happens because of the presence of magma below the surface of the lakes and this magma releases carbon dioxide into the water which causes the resulting spewing of the gas into the atmosphere.
* **Rocks that move by themselves:** Some rocks on our planet Earth move by themselves. However, scientists have failed to capture the actual motion of these rocks because they move so little but their movement is certain.
* Scientists have recently estimated that **an ocean of water exists at a distance of 621 miles under the surface of the Earth.** And this water is important for volcanic activity, which in turn is responsible [for generating soil](http://www.dailymail.co.uk/sciencetech/article-3960442/An-ocean-water-620-miles-Earth-s-surface-dries-life-planet-END.html).



**Weathering and erosion from water created the Grand Canyon.**This huge canyon was carved by the flow of the Colorado River over many years.



**Mushroom rocks (Smoky Hills area of Kansas) are created by wind erosion.** The wind carried sand close to the ground, carving the bottom of these rocks more than the top.



**Split Apple Rock in New Zealand was caused by ice expanding and splitting rocks apart.**Geologists believe that this huge boulder was split during one of the Earth’s ice ages.