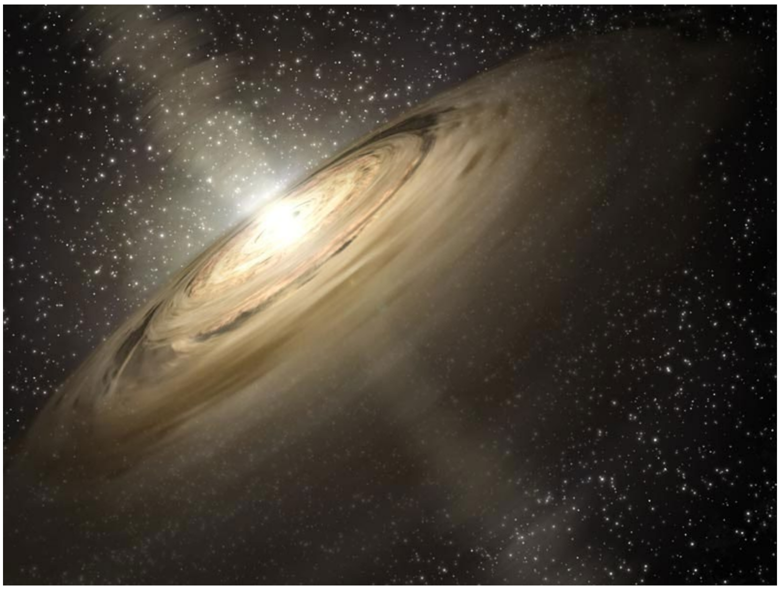
The Earth is made from exploding stars

Our solar system was created around **4.7 billion years ago,** when a huge cloud of stardust (debris from older exploded stars) contracted under gravity.

The mass began to spin as it contracted – much like a figure skater – and formed a disc with a bulge at the center.

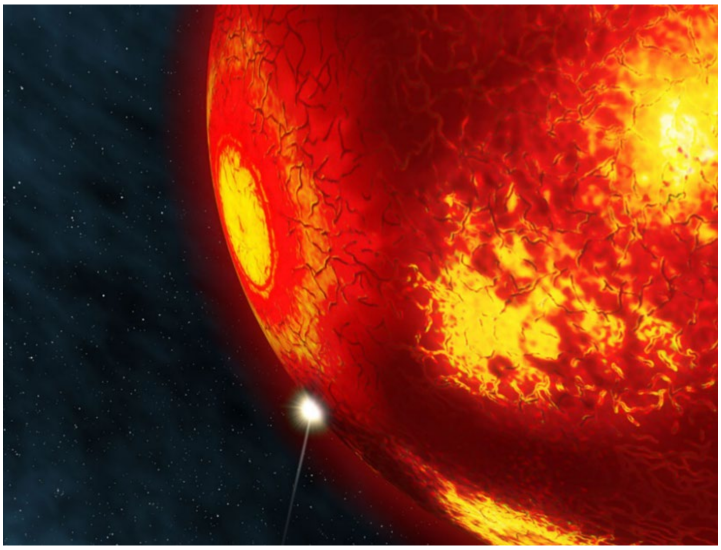
The bulge developed into our Sun, which contains 99% of the solar systems mass.

The Sun got hotter as the material **compressed** together, until finally it was hot enough for a nuclear reaction to start.



The remaining material was flung out along a **single plane** and material lumped together at various distances from the Sun to form planets, including **Earth**. The gravity created by the planet's mass caused the planets to become spheres. The gravity of the Sun caused the planets to orbit the Sun rather than traveling away. The Moon was created when a smaller planet smashed into Earth and the fragments formed into a circular orbiting satellite.

The early Earth looked very different to how it is today



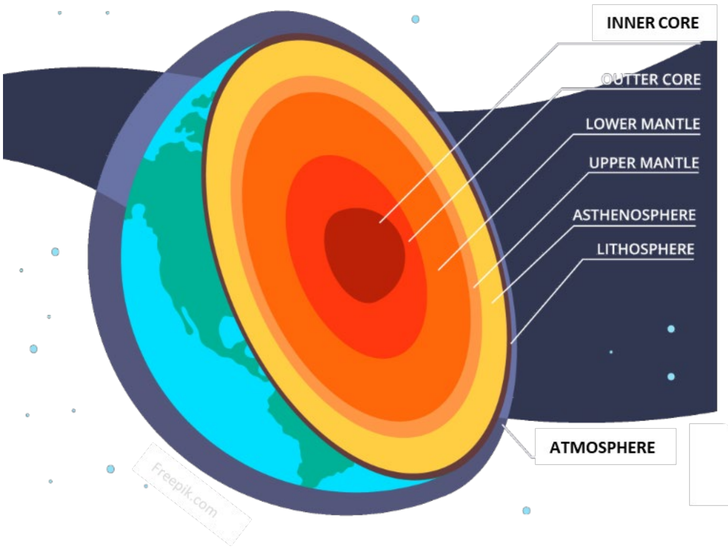
The Earth formed over 4 billion years ago and the heavier matter such as iron sank to the centre and lighter matter such as silicon and carbon rose toward the surface. The planet became layered, and the layers of the core and mantle were formed.

Much of the matter that went toward the centre contained radioactive material, an important source of Earth's internal heat.

Shortly after the Earth and the Moon were formed, they underwent a period when they were bombarded by meteorites, the rocky remains left over from the formation of the solar system. Huge impact craters are still visible on the Moon's surface, which is unchanged. Earth's craters, however, were long ago erased by weathering, erosion, and mountain building.

Huge amounts of energy released from the meteorite impacts created extremely high temperatures on Earth, that melted the outer part of the planet and created the crust.

Earth Structure



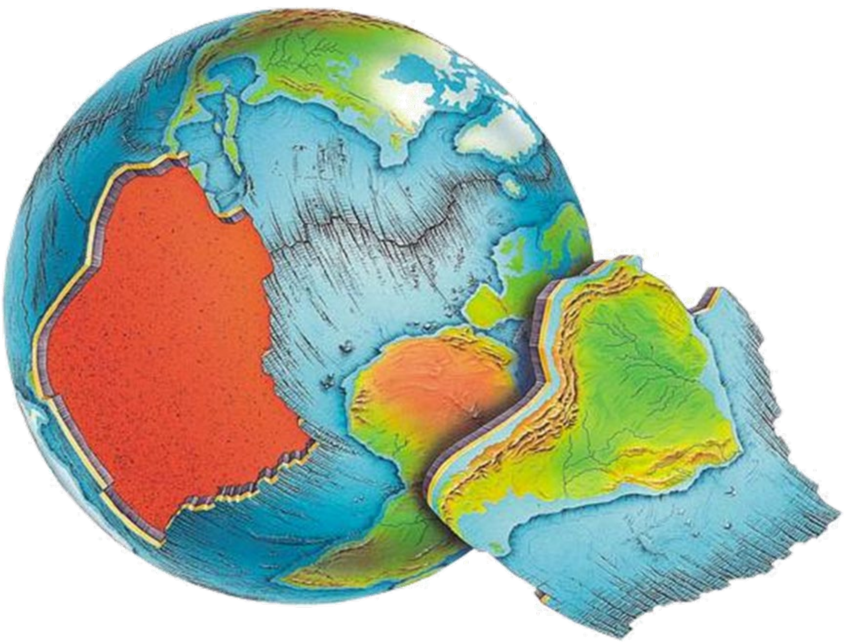
The Earth is made up of different layers, each one of them composed of different materials. In the centre of the Earth is the heaviest material, mainly composed of Iron. Further out is dense heavy rock and near the surface is lighter rock.

The thin layer of solid rock which covers the Earth is called the **crust**. Under this is the **mantle**. The middle of this is molten - so the upper mantle and crust float on this. The inner layer is the **core**, which is a solid core surrounded by molten rock.

The crust is made up of the thick continental crust that forms the land and the much thinner oceanic crust that makes up ocean floors.

Plate Tectonic Theory

Earth's crust is divided into large plate that can move in relation to each other. They fit together to cover the earth. The continents are made of lighter rock and are carried along on top of the plates.

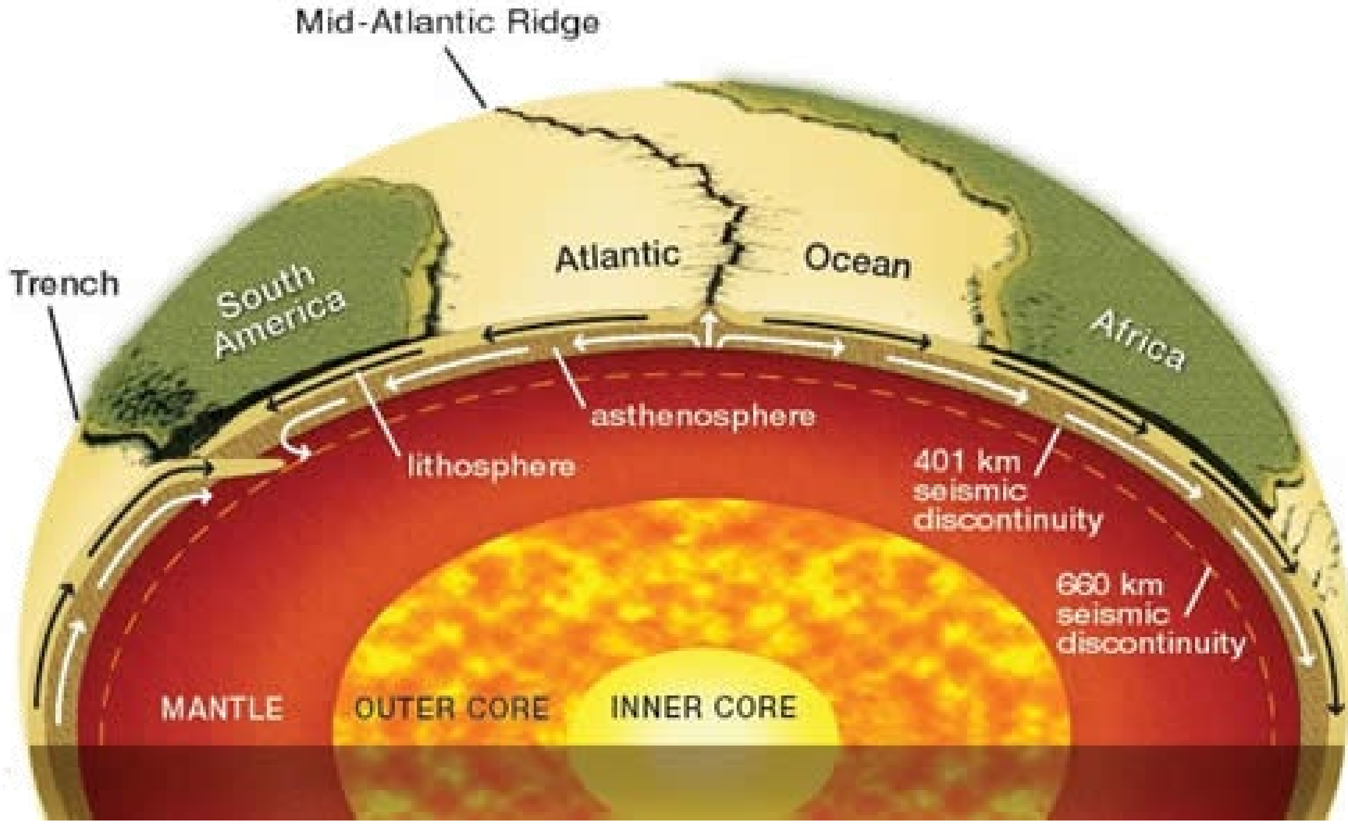


Earth's heat drives plate movement

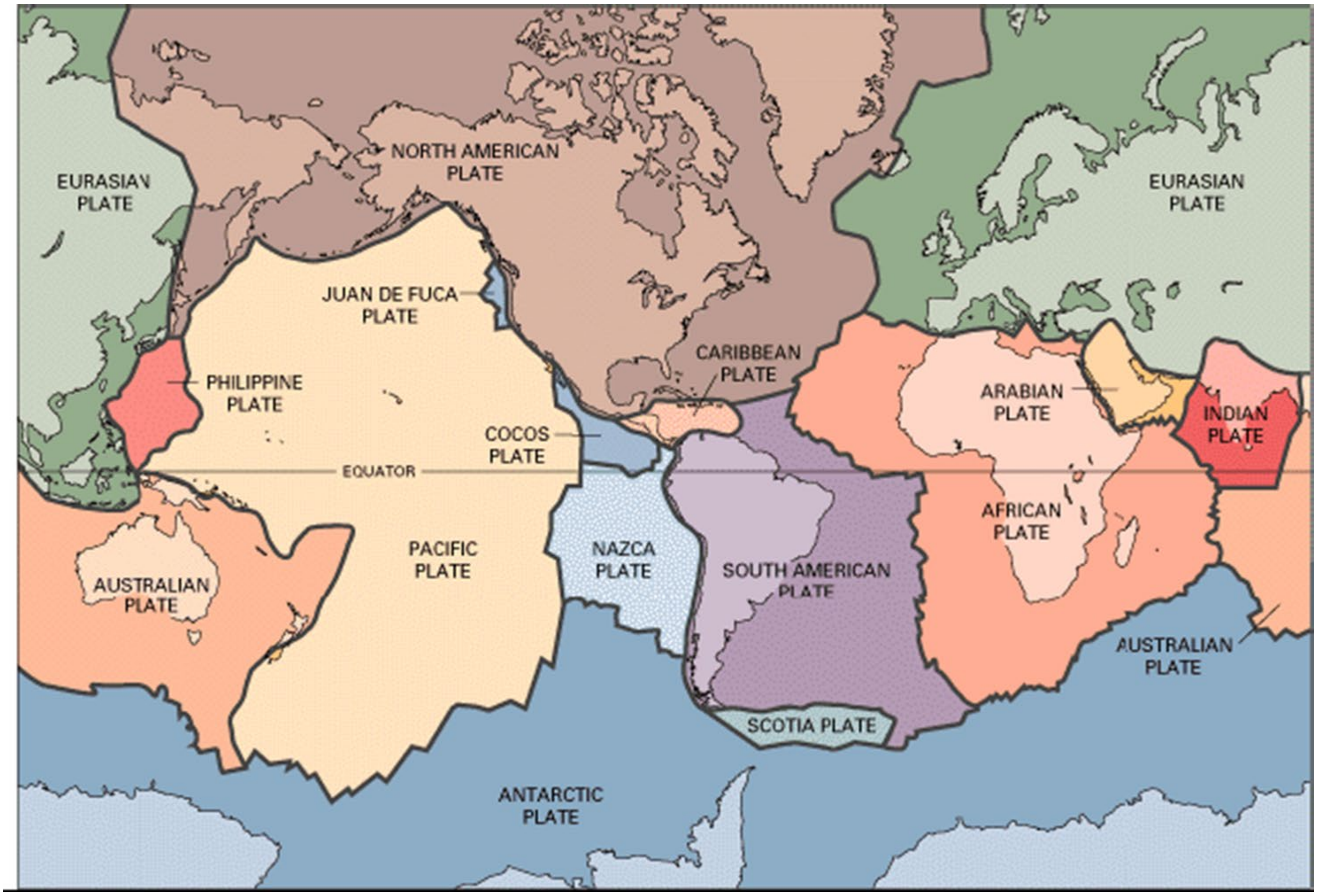
The plates float on hot, semi molten magma. Deep inside Earth's core, heat produced Earth's formation and heat that forms from radioactive decay flows out into the upper layers.

This heat causes the magma in the lower mantle rock to expand and become less dense. This magma rises in convection currents. When the magma currents get near the crust they are pushed sideways and travel in different directions. These immensely powerful currents slowly float the huge tectonic plates across the planet's surface.

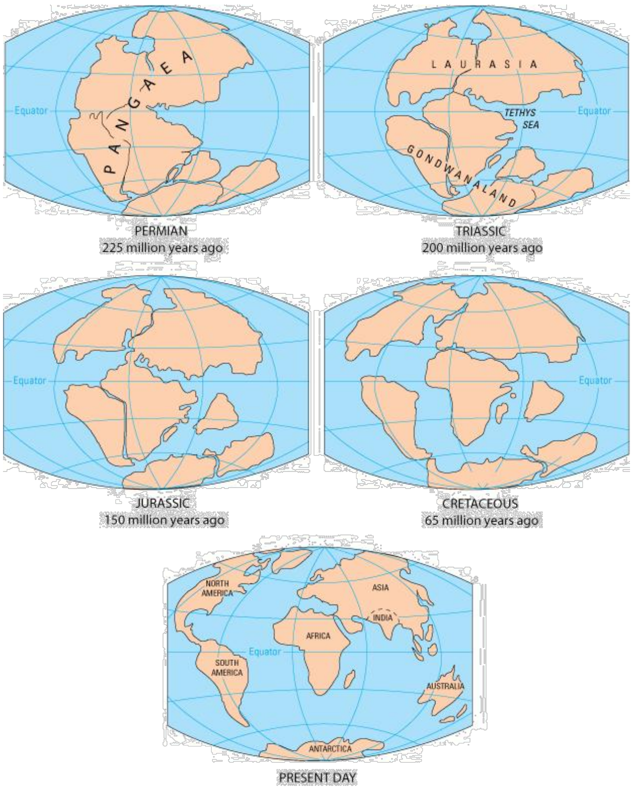
The Lithosphere, the Crust, and top part of the Mantle are divided into large areas called plates, which are constantly moving. The plates move slowly over the Asthenosphere, which is the molten layer in the mantle, at a rate of about 3cm a year.



Plates can move towards each other, apart from each other, or shift sideways. Because all the plates fit together, movement of one plate effects all plates around it. The study of plate movement is called **plate tectonics** and the observable effect is called continental drift.



There is evidence for continental drift - EXTENSION



Evidence supports the conclusion that 200 million years ago, at the start of the Mesozoic era, all the continents were attached to one another in a single land mass, which has been named Pangaea.

During the Triassic, Pangaea began to break up, first into two major land masses: Laurasia in the Northern Hemisphere and Gondwana in the Southern Hemisphere.

The present continents separated at intervals throughout the remainder of the Mesozoic Era (from approximately 250 to 65 million years ago) and continued through the Cenozoic Era (65 million years ago until present time), eventually reaching the positions they have today.

Shape of the Continents – close fit of continents

The east coast of South America and the west coast of Africa match especially at the boundaries of the continental slopes rather than the shorelines.

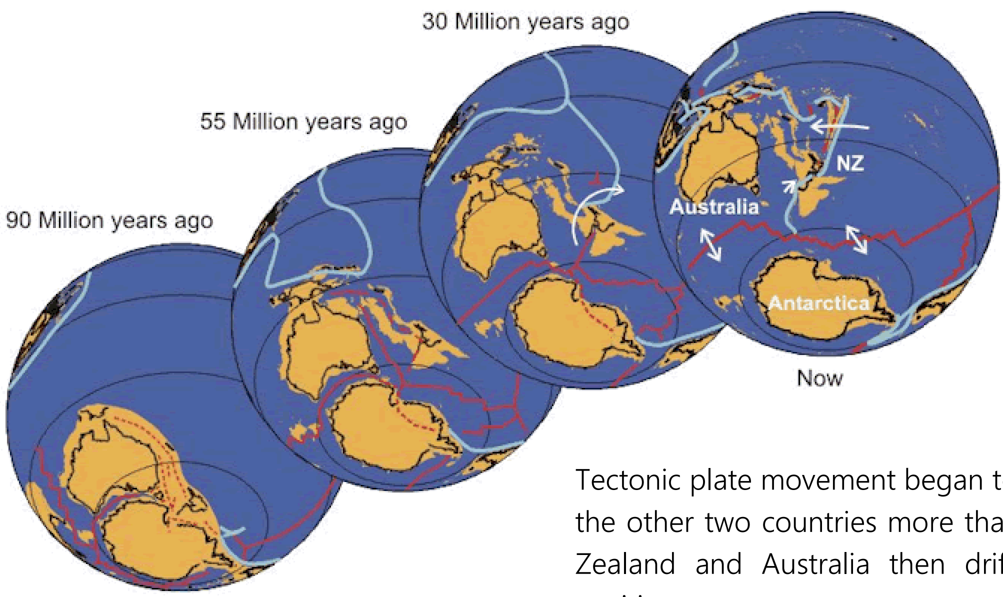
Geology – similar rock patterns

In both mineral content and age, the rocks on the coast of Brazil match precisely those found on the west coast of Africa. The low mountain ranges and rock types in North America match parts of Great Britain, France, and Scandinavia.

Fossils – patterns in distribution

The same fossil reptiles found in South Africa are also found in Brazil and Argentina.

Formation of New Zealand - EXTENSION

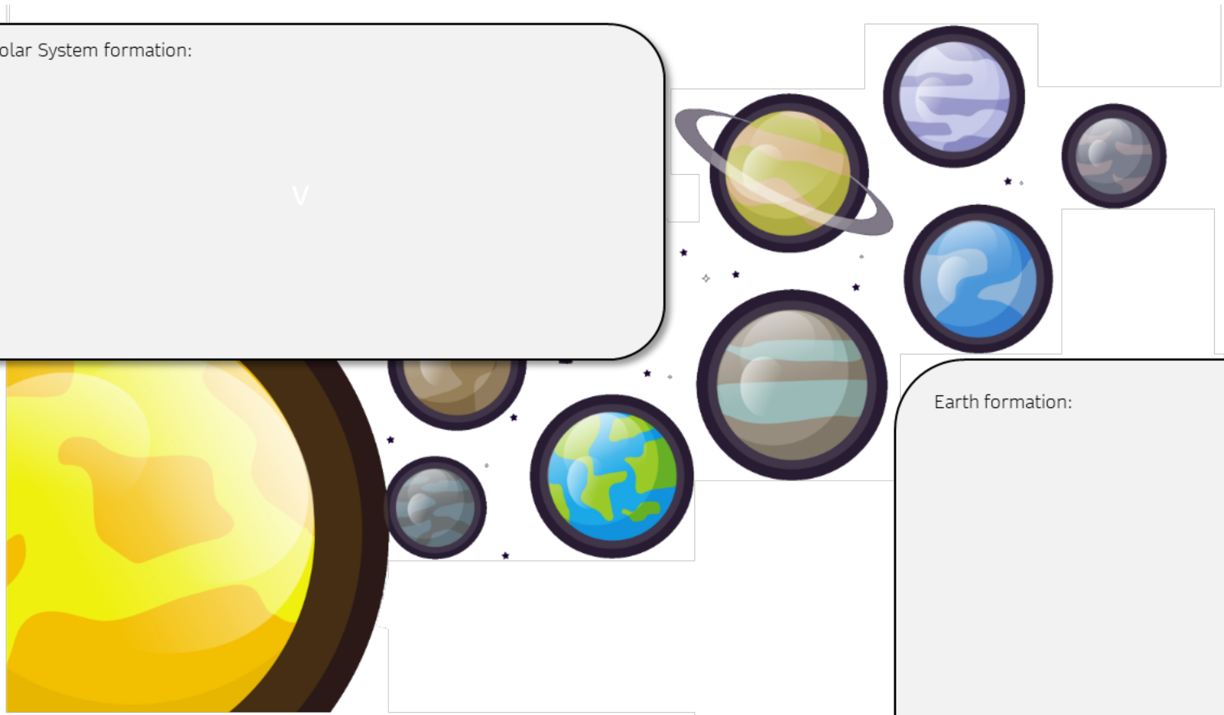


New Zealand was originally formed from sediments eroded from the much older land mass of Australia. Around 90million years ago New Zealand, Australia and Antarctica were still connected as one continent called Gondwana.

Tectonic plate movement began to separate New Zealand and the other two countries more than 70 million years ago. New Zealand and Australia then drifted north to their current positions.

1. Research and add to the diagram below with the approximate time each event occurred, plus other relevant information.

Solar System formation:



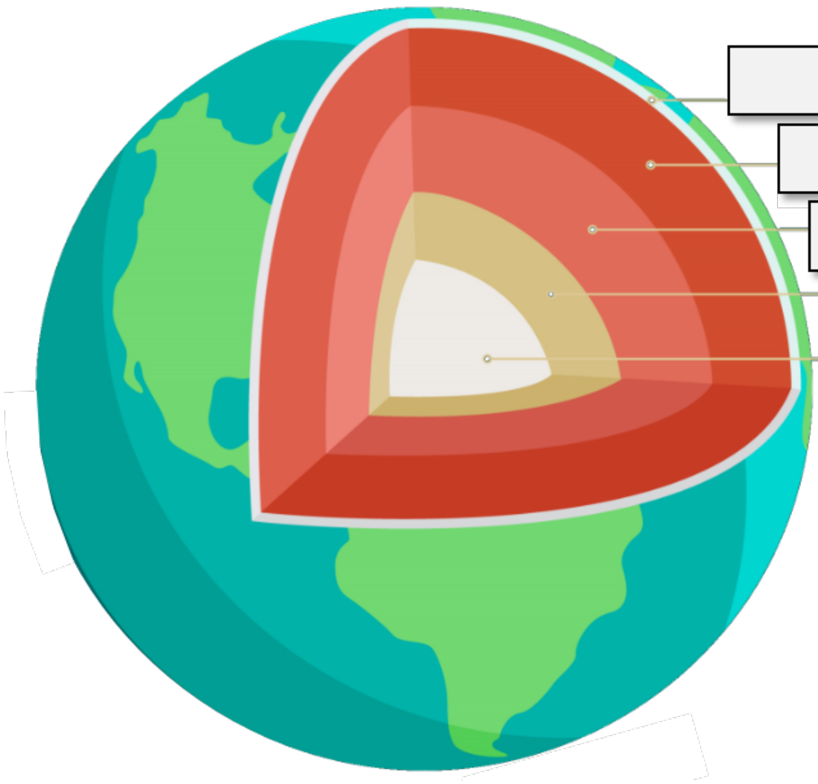
Earth formation:

Pangaea formation:

Gondwana formation:

New Zealand formation:

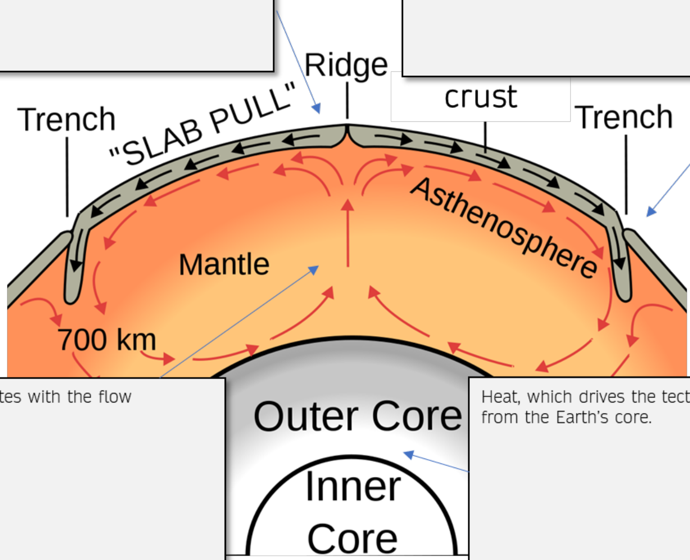
2. Label the structure of the Earth.



3. Add further detailed information to the labelled diagram to explain Plate Tectonic Theory

New plate material forms at a ridge

Where two plates collide, subduction can occur



Molten magma circulates, carrying the plates with the flow

Heat, which drives the tectonic plate movement, comes from the Earth's core.