

8.1 The structure of the earth

The earth we live on is the third planet from the sun in the solar system.

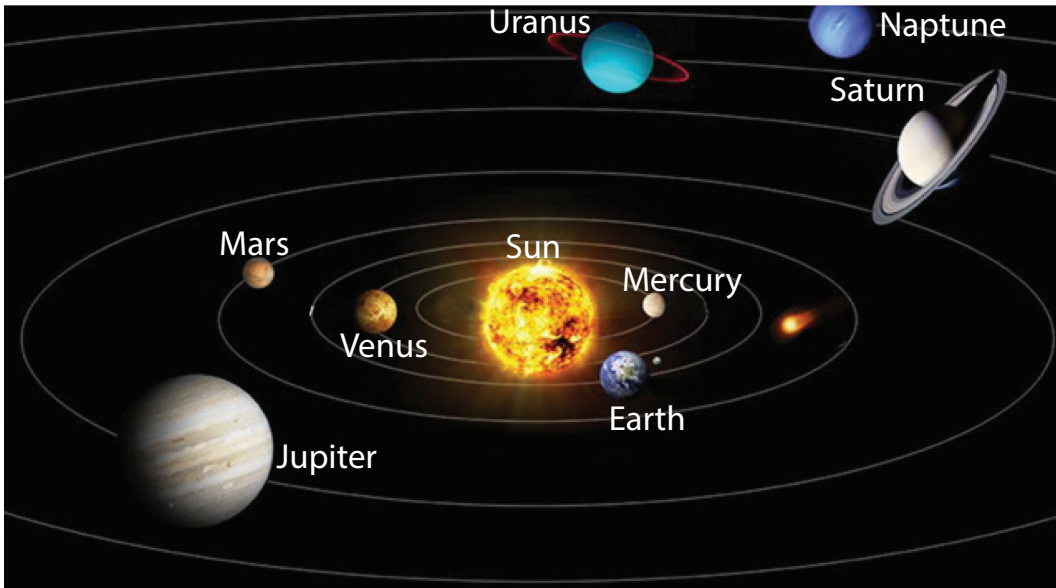


Figure 8.1 ▲ Solar System

When compared to other planets of the solar system, the earth looks more beautiful because there are mountains, rivers, oceans, flora and forests on it. Since they are favourable environmental conditions, there is life on earth. The other planets are lifeless because of the non-existence of such environmental conditions.



Figure 8.2 ▲ Different types of environments on the earth

What is the nature of the inner part of this beautiful earth?

Geologists obtain information about the nature of the inner part of earth using different methods.

In times of volcanic eruptions, different types of rocks are brought to the surface of the earth. By examining them, geologists obtain information about the inner part of the earth.

Geologists receive more information about the nature of the inner part by examining earthquakes. During earthquakes huge rock movements within the earth give rise to **seismic waves**. These waves reach the surface of the earth by running through various layers of the earth.

Seismometers are installed in different stations of the earth. Seismic waves are automatically marked by these seismometers. (A Seismometer is installed in Pallekelle, Sri Lanka.) The speed of seismic waves running through various layers of the earth are different. Information about internal layers of the earth can be obtained by measuring those speeds.

That information has helped to discover that the inner part of the earth consists of several layers different from each other.

As shown in Figure 8.3, the inner part of the earth can be divided into three layers. They are **core, mantle and crust**.

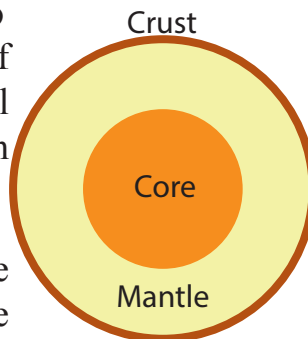


Figure 8.3 ▲ Cross section of the Earth

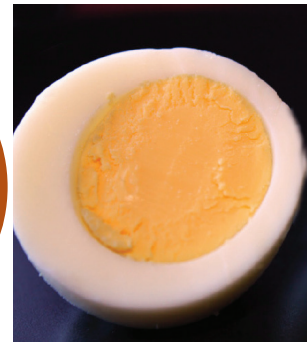


Figure 8.4 ▲ Cross section of a hard boiled egg

It is a replica of a hard boiled egg cut across from top to bottom. The inner parts of earth can be compared to this replica of an egg.

Egg yolk	→	Core
Egg white	→	Mantle
Egg shell	→	Crust

Information on the structure of the earth from its surface to the core are given below.

Crust

The surface of the earth where life exists is the crust. When compared with the size of the earth, it is a thin layer. Mountains, plains and oceans are found on the crust. Its thickness varies from place to place. At the bottom of the oceans its thickness is about 5 km. On land its thickness is about 35 km. The earth's crust consists of rocks and soil. It is made up of basic elements like oxygen, silicon and aluminium.

The earth's crust provides most of the elements necessary for our sustenance.

e.g.:- Construction materials

Metals

Fossil fuel

Soil for agriculture

Mantle

Underneath the earth's crust lies the mantle. Its thickness is about 2900 km. It consists of rocks. These rocks contain oxygen, silicon, magnesium and iron. The upper part consists of solid rocks. The lower part is made up of molten rocks due to extreme hot environment.

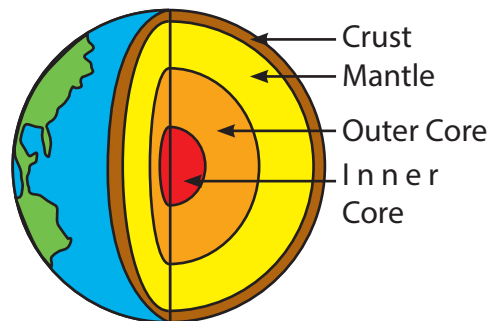


Figure 8.5 a ▲ Inner nature of the earth

Core

The innermost part of the earth is the core. Its thickness is about 3500 km. The upper part of it is made up of molten iron and nickel metals. The temperature of this area is between 4400 °C - 5000 °C.

Due to high pressure, the lower part of the core remains hard. Its temperature is more than 5000 °C which is as high as the temperature on the surface of the sun.

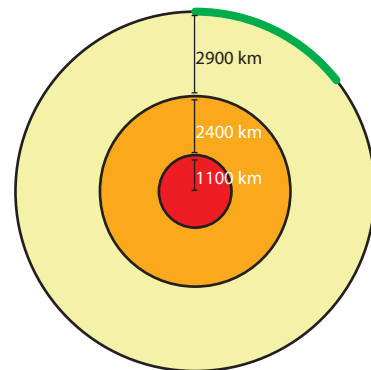


Figure 8.5 b ▲ Thickness of the inner layers of the earth

Table 8.1 Layers of the earth

Part of the earth	Thickness	Composition	Elements present	Special Information
Crust	Deep bottom of oceans 5km Land 35km	Rocks Soil	Silicon Aluminium Oxygen	Very thin layer
Mantle	2900km	Solid Rocks and Molten Rocks	Silicon Magnesium Iron Oxygen	Upper part consists of solid rocks due to high temperature Molten rocks are in the lower part
Core	3500km	Upper part consists of molten, iron and nickel metals	Molten iron and nickel	Temperature between 4400-5000 °C



Activity 8.1

Preparation of a replica of the internal structure of the earth

You will need :- 35 x 35 cm piece of cardboard, saw dust, paint in three colours, glue

Method :-

- Draw a circle with a radius of 1 cm at the centre of the cardboard.
- Draw a circle with a radius of 7 cm which is concentric with the above circle.
- Draw another circle with a radius of 13 cm which is concentric of above two circles.
- Now you will get a Figure like 8.5 b.
- Put saw dust in three colours.
- Paste them on three layers and name them.

Now show your creation to the teacher.



Activity 8.2

Preparation of a three dimensional replica of the internal structure of the earth

You will need :-

Clay in three colours, a sharp knife

Method :-

- Make a globe of the size of a lime using clay of one colour.
- Taking a half of the diameter of the previous globe, paste a separate coloured layer of clay on the top of the globe.
- On the top of the second clay layer, paste a different colour of clay layer which is thin as much as possible.



Figure 8.6 ▲ Model of the internal structure of the earth

- Use a sharp knife and cut the clay globe you made into two equal halves.
- The above cross section of the clay globe shows how inner layers are placed. Show it to your teacher.



Assignment 8.1

Prepare the model made in Activity 8.2 using clay/ Polystyrene/ paper pulp. Cut them into two equal halves and examine the cross section of the models.

8.2 Tectonic plate and plate tectonics

Figure 8.7 shows an earth map of a strong earthquake on 25th April 2015 in Katmandu, Nepal. Thousands of people died and thousands of

people. got injured, while thousands of people were left homeless. This earthquake occurred on the Eurasian and Indian plate margins. Two destructive earthquakes have been recorded in the year 1905 and 1934 in this area.

-News on Internet-

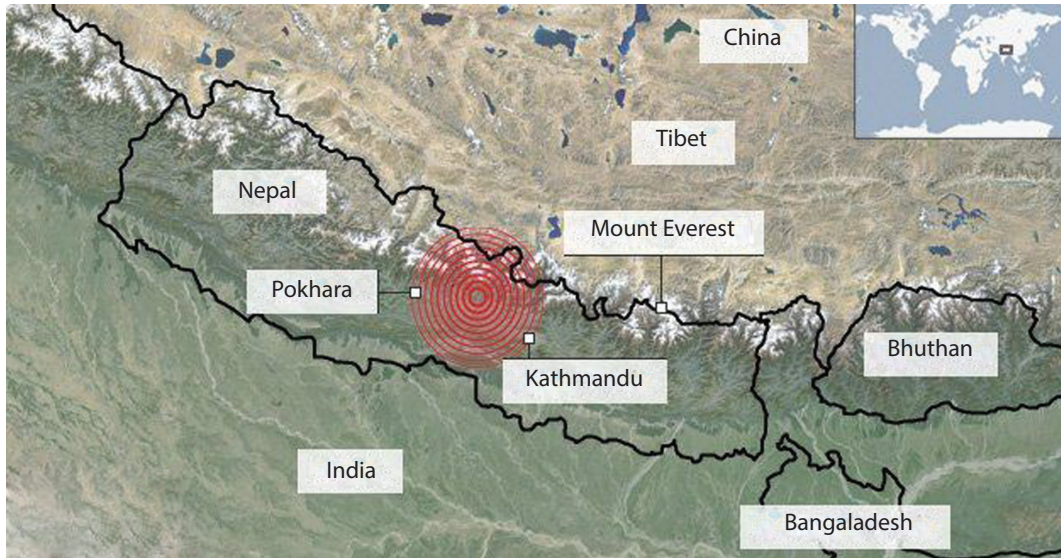


Figure 8.7 ▲ Location of earthquake on 25-04-2015

The surface layer of the earth is the crust. The crust is divided into sections called tectonic plates. These tectonic plates move relatively to each other.

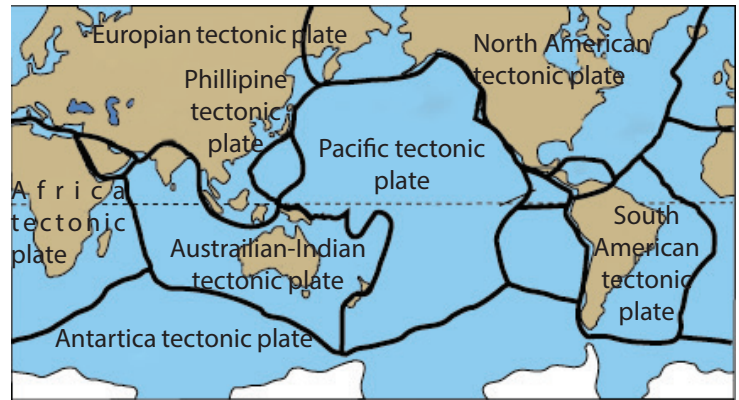


Figure 8.8 ▲ Tectonic plates of the earth



Assignment 8.2

Study the map in Figure 8.8. It shows the tectonic plates of the earth. Find tectonic plates near Sri Lanka, India and Nepal.

Tectonic plates move relatively to each other in three ways.

- According to the Figure 8.9 **a** two plates move apart. As a result, a deep gulf could occur.
- According to the Figure 8.9 **b** one plate moves upward by pressing down the other. An earthquake could occur in this instance.
- According to Figure 8.9 **c** two plates slide past each other. earthquakes could occur in this instance too.

Tectonic plates move very slowly. It is 1 - 2 cm per year.

Plate movements can be recognized on plate margins. Most of the plate boundaries or margins are at the bottom of the sea. When they occur on land they can be easily recognized.

One such plate margin is located in North America. It is known as San Andreas Fault. It is visible in a birds eye view/an aerial view as a fracture of 1000 km in length in the state of California.

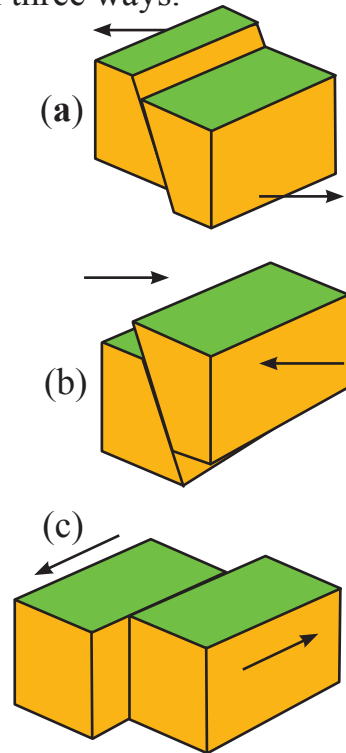


Figure 8.9 ▲



Figure 8.10 ▲ San Andreas Fault

The North American Plate and the Pacific Plate are situated on either side of this tectonic boundary. These two plates slide past each other for about 2.5 cm per year. On these tectonic boundary earthquakes occur frequently.

Tectonic plates float on the molten rocks of the lower mantle. Because of the movement on the molten rocks plate, tectonics also move.

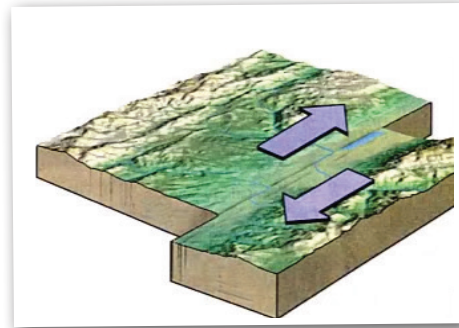


Figure 8.11 ▲ How tectonic plates slide



Assignment 8.3

Do a literature search to find out the geological history of the earth and prepare a report. Use the internet, reports on geological findings and geographical books.



Activity 8.3

Demonstrating the activity of plate tectonics

You will need :-

A yellow coloured orange with a thick skin, a knife

Method :-

- Cut the orange with the skin into different shapes.
- Keep the orange between the two palms.
- Then slowly press the orange while observing the movement of parts of the peels.



Figure 8.12 ▲ Replicate plate tectonics using an orange



For extra knowledge

In 2004, Tsunami brought severe destruction to the coastal areas of Sri Lanka. This happened because of an earthquake occurred near the Sumatra Island due to collision of tectonic plates.

Now you can understand that the earth's crust where we live is not an immovable thing.



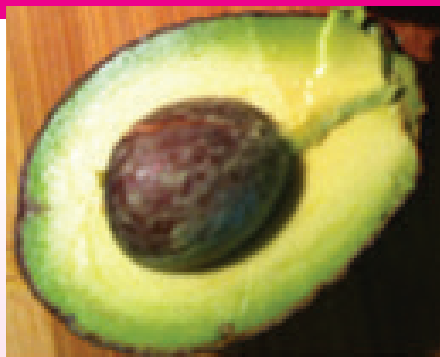
Summary

- In the solar system, the earth is the most suitable planet for the living beings.
- The inner part of the earth consists of three layers; the core, the mantle and the crust.
- The earth's crust consists of tectonic plates which move relatively to each other.
- Tectonic plate margins consist of volcanoes and constant earthquakes occur near them.

Exercise

1. A cross section of an avocado is shown here.

A cross section of the earth consists of core, mantle and crust. Which sections of the avocado corresponds with above three areas?



2.
 - I) Name four resources obtained by man from the earth crust.
 - II) On which tectonic plate Sri Lanka is situated? Why severe earthquakes do not occur in Sri Lanka?
 - III) State two methods used by geologists to obtain information about the internal structure of the earth.
 - IV) State three countries where earthquakes occur frequently.

Technical Terms

Core	- னரச	- அகணி
Mantle	- ஸூலர்னச	- ஡ென்முடி
Crust	- கலெல	- ஓடு
Rocks	- ஸாஊன	- ஡ாறைகள்
Tectonic plates	- ஐ நட்டு	- ஡ுவித்தகடுகள்
Plate tectonics	- ஐ நட்டு லலனச	- ஡ுவித் தகட்டியக்கம்
Earthquakes	- ஐ க஡ீ஡ன	- நிலநடுக்கம்
Seismic waves	- ஐ க஡ீ஡ன நரஃஃ	- நிலநடுக்க அலைகள்
Seismometer	- ஐ க஡ீ஡னலானச	- நிலநடுக்கமானி
Volcanoes	- கிநி கடி	- ஂரி஡லைகள்