

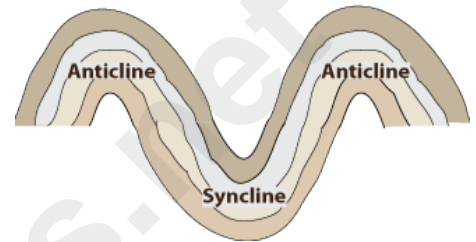
Folding and Faulting

The tectonic movements which occur in the interior of the Earth are of two kinds—epeirogenic (vertical) and orogenic (horizontal).

Vertical and Horizontal Movements

Vertical movements are associated with plate tectonics. They cause the upliftment (rise) or subsidence (sinking) of the land. Because vertical movements are powerful, they are also known as continent building movements.

Horizontal movements take place because of compressional or tensional forces. They are responsible for the formation of fold mountains. When compressional forces act from two opposite directions, the rocks on the crust of the Earth bend and form arches, troughs or mountains. This is known as **folding** of crustal rocks. **Anticline** is the arch or the upward fold, while **syncline** is the downward fold.

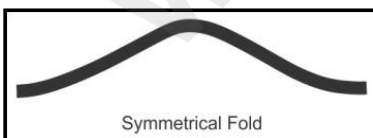


Sometimes, when the crustal rocks are subjected to horizontal compressional pressure, they do not get folded. Instead they develop fractures or cracks along the line of weakness. These lines of fracture are known as **faults**. The movement of the part of the Earth's crust along the line or fault is known as **faulting**. Block mountains are formed because of faulting.

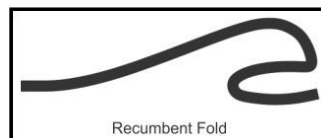
Folding

In folding, because the compressional forces act from two opposite sides towards the centre, the land in the centre rises in a series of folds. There are various types of folds. These are

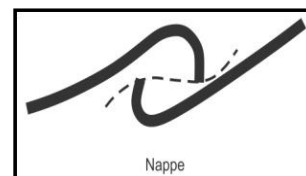
- **Symmetrical folds:** When two compressional forces act from two opposite directions, gentle and simple folds are formed which are known as symmetrical folds.
- **Asymmetrical folds:** When the compressional force is intensive from one side, one limb becomes steeper than the other, and the folds which are formed are known as asymmetrical folds.
- **Recumbent fold:** When the fold is pushed further, the limbs get placed in a horizontal position known as recumbent fold.
- **Overthrust fold:** When one side of a fold slides past the other side of the fracture or fault, it is known as an overthrust fold.
- **Fan-shaped fold:** Sometimes, small arches are formed when the compressional forces act from opposite sides. Under such circumstances, many fan-shaped folds which resemble a fan are formed.



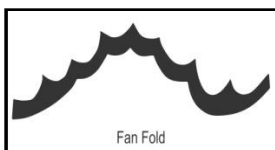
Symmetrical Fold



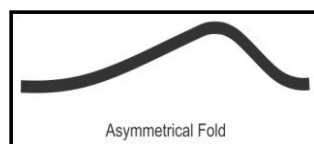
Recumbent Fold



Nappe



Fan Fold



Asymmetrical Fold

Fold Mountains

When the two tectonic plates move against each other, the compressional forces cause the crust of the Earth to fold. This leads to the bending of the crustal rocks resulting in the formation of fold mountains. Fold mountains are formed in a zone where the crust of the Earth is the weakest.

Because there are many parallel folds and troughs, folding results in the formation of long chains of parallel mountain ranges having high peaks. The Himalayas, Alps, Rockies and Appalachians are famous fold mountains.

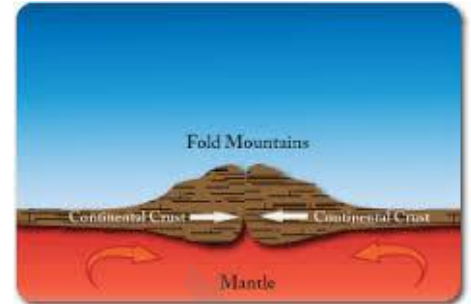


Diagram depicting the formation of fold mountains

Characteristics of Fold Mountains

Some characteristics of fold mountains:

- Existence of peaks and valleys is an important feature of fold mountains. The top of anticlines are mountain peaks, while the synclines are valleys.
- In between the high ranges of fold mountains, intermontane plateaus may be found.
- Fold mountains have many parallel ranges.
- Waterfalls and rapids are present in fold mountains.
- Many glaciers are found in this mountain system.
- A region of the fold mountain system is usually also the region of volcanoes and earthquakes.

Faulting

Faults result in the formation of block mountains. There are three main kinds of faults. They are

Normal faults: Normal fault is a simple fault where the blocks of the rocks move up or down. In a normal fault, a piece of land may slide down along the fault plane.

Reverse fault: Because of compressional forces acting from opposite directions, a block of rock is forced up and over other rock against the slope of the fault plane.

Tear fault: When the blocks on the either side of the fault are displaced horizontally or sideways, tear faults take place. Tear faults generally occur during earthquakes.

Main Features of Faulting

Main features of faulting:

- Usually, faults do not occur singly but run parallel to each other.
- The elevated or subsided rocks are known as fault blocks.
- A piece of block which is elevated is called horst.
- A depressed piece of land between two elevated blocks is called a graben or rift valley.

Landforms Formed by Faulting

Rift valleys and block mountains are two main landforms formed due to faulting.

- Rift valley: A rift valley is formed when the middle portion of a land between two faults subsides. It is also formed when the middle land remains stable but the two side blocks rise upwards.
- The East African Rift Valley is the longest rift valley in the world. Rift valleys have flat bottom and steep sides.
- Many rift valleys also become lakes such as Lake Nyasa in Tanzania. In India, the Damodar Valley and Tapi Valley are examples of faulting.

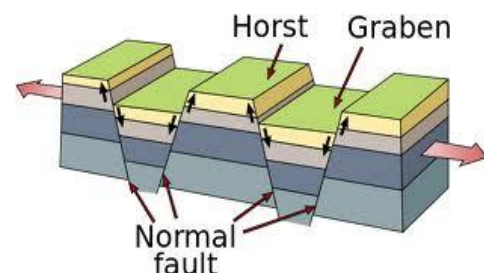


Diagram depicting formation of landforms by faulting

Block Mountains

The mechanism of the formation of block mountains is similar to a rift valley. Because of tensional features, when a piece of land between two parallel folds subsides, a rift valley is formed. However, when a piece of land rises, a block mountain is formed. In the above figure, while a graben represents a rift valley, an elevated piece of land known as horst denotes a block mountain. Some examples of block mountains are the Vogues Mountains in France and the Black Forest Mountains in Germany.

Plate Tectonics

According to plate tectonic theory, the outer shell of the Earth is made of several lithospheric plates. Each plate moves slowly in the asthenosphere which is a semi-molten sphere existing under the surface of the Earth. Each plate moves as a single independent body. There are constructive plate margins, destructive plate margins and conservative plate margins. Six major tectonic plates are the Pacific plate, Eurasian plate, American plate, African plate, Indian plate and Antarctic plate.

Distribution of Folded and Faulted Landforms

- The fold mountain system arranged in long lines is found almost in every continent. Most of them are interlinked arcs extending through oceans. The Alpine Himalayan system is one such example which stretches between Africa, Arabia and India in the south and Europe and Asia in the north.
- The Circum Pacific Belt comprises the Andes, the North American Cordillera and Island arcs. These two systems of fold mountains meet in Australia.
- Block mountains along with rift valleys are also found throughout the world. Sierra Nevada Mountains in California, USA, are one of the major mountain systems in the world. Because rift valleys are caused by weakness of the crust, earthquakes and volcanoes are generally associated with these landforms.