Faults and Folds

Folding and Faulting are two features seen in collision mountains. These occur when stress is greater than the strength of the rock, and the rock deforms.

When stress is applied to rocks they first deform elastically (bend).

Once the elastic limit is reached then one of two things happen (depends on if the rock is in a deep Earth or a surface environment):

- Deep Earth – plastic def. resulting in folding or flow.
- Surface – plastic def. to elastic limit and then fracture.

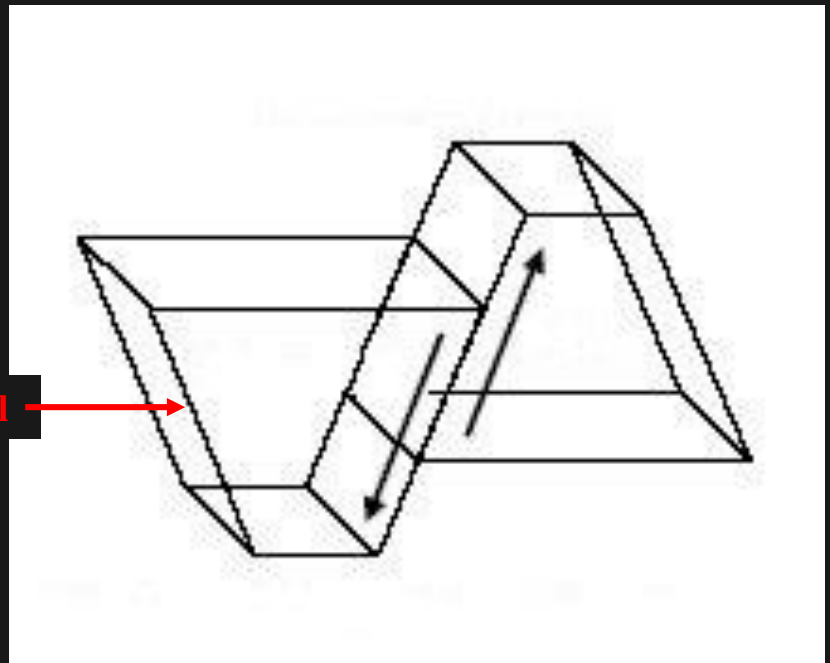
Reference:
Tarbuck and Lutgens
Pages 426-432

Faults

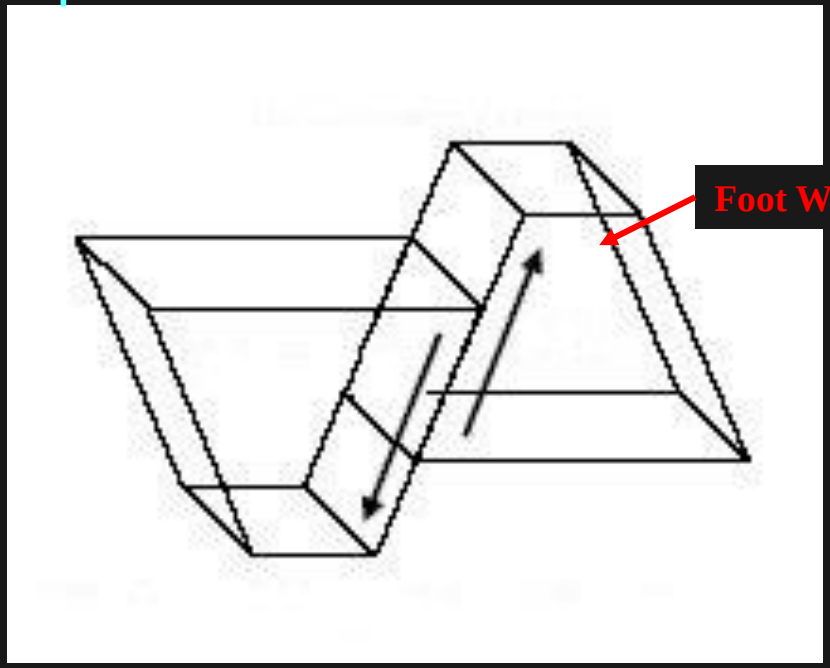
Fault

a break or crack in Earth's crust along which movement has occurred.

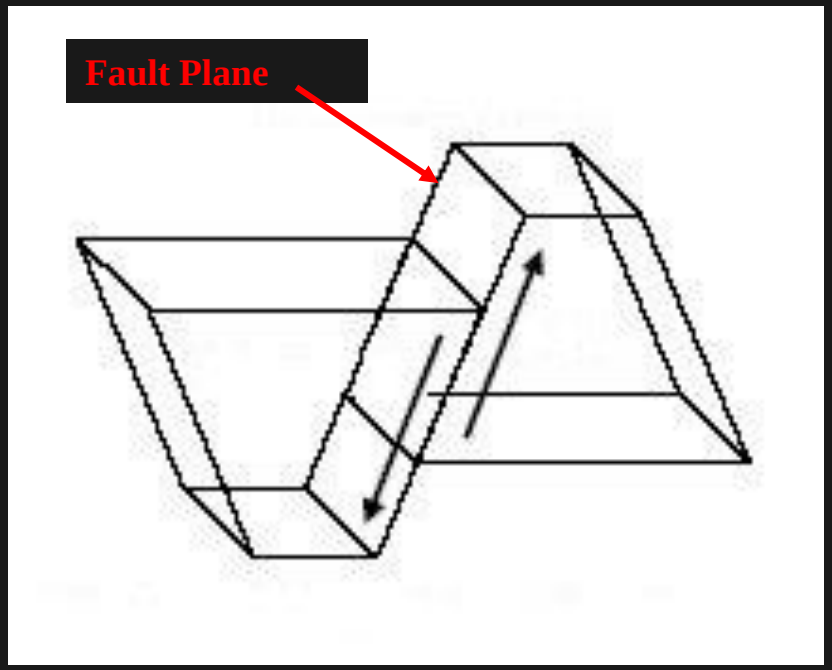
1) Hanging Wall - the top part of the rock above the fault plane.



2) Foot Wall - the bottom part of the rock below the fault plane.

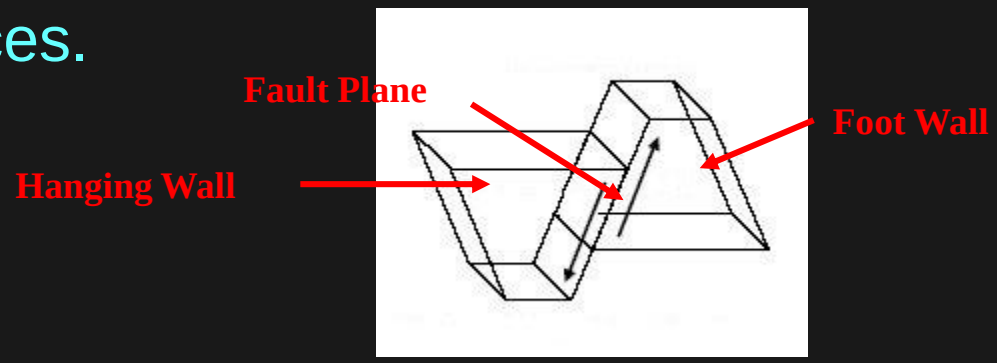


3) Fault Plane - the surface that separates the two moving pieces.



Three parts of a Fault in case you missed it:

1) Hanging Wall - the top part of the rock above the fault plane.
2) Foot Wall - the bottom part of the rock below the fault plane.
3) Fault Plane - the surface that separates the two moving pieces.



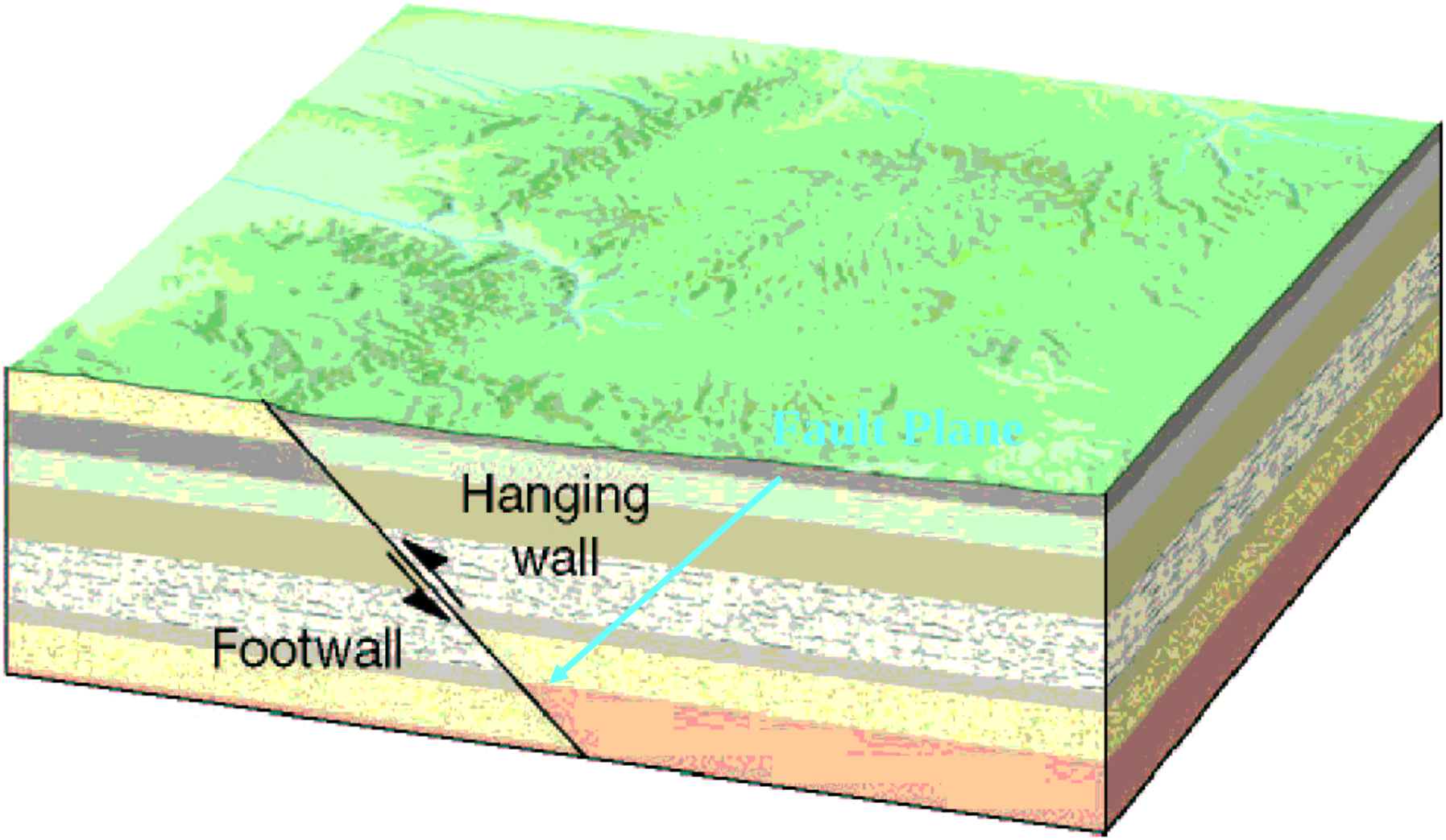
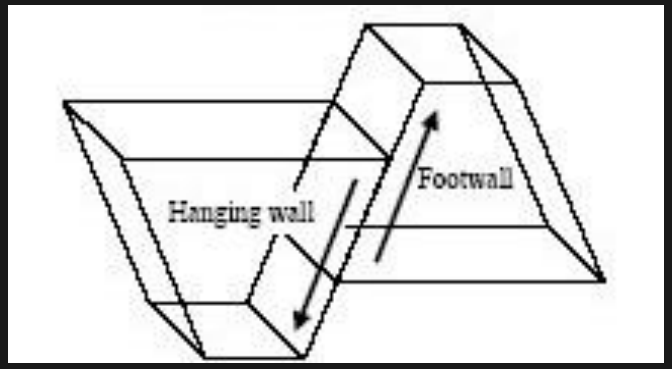


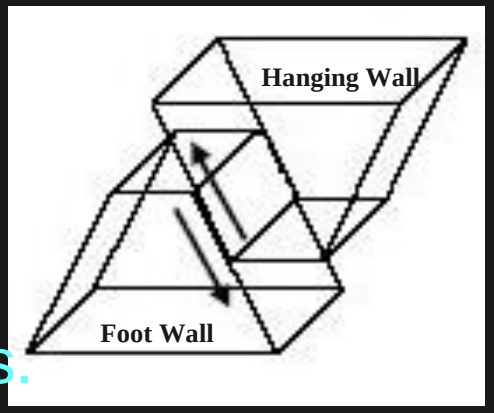
Figure 15.24 Block diagram showing the relative movement along a reverse fault.

Fault Types



1) **Normal Fault (dip-slip)**

- Caused by tensional forces.
- Hanging wall drops in relation to the foot wall.

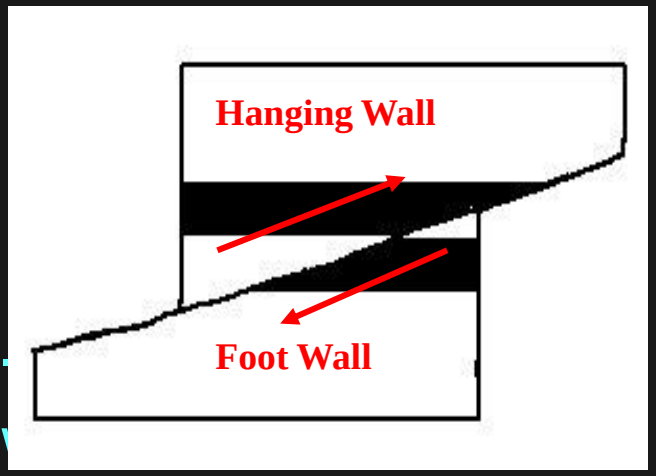


2) **Reverse Fault (dip-slip)**

- Caused by compressional forces.
- Hanging wall moves upward in relation to the foot wall.

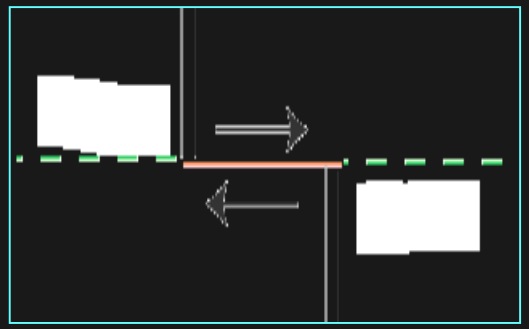
3) **Thrust Fault (dip-slip)**

- Caused by Compressional forces.
- Hanging wall moves up over foot w
- Low angle reverse fault.



4) **Transform Fault (strike-slip)**

- Caused by shearing forces.
- Two plates slide side by side.
- No vertical movement.



Transform Fault

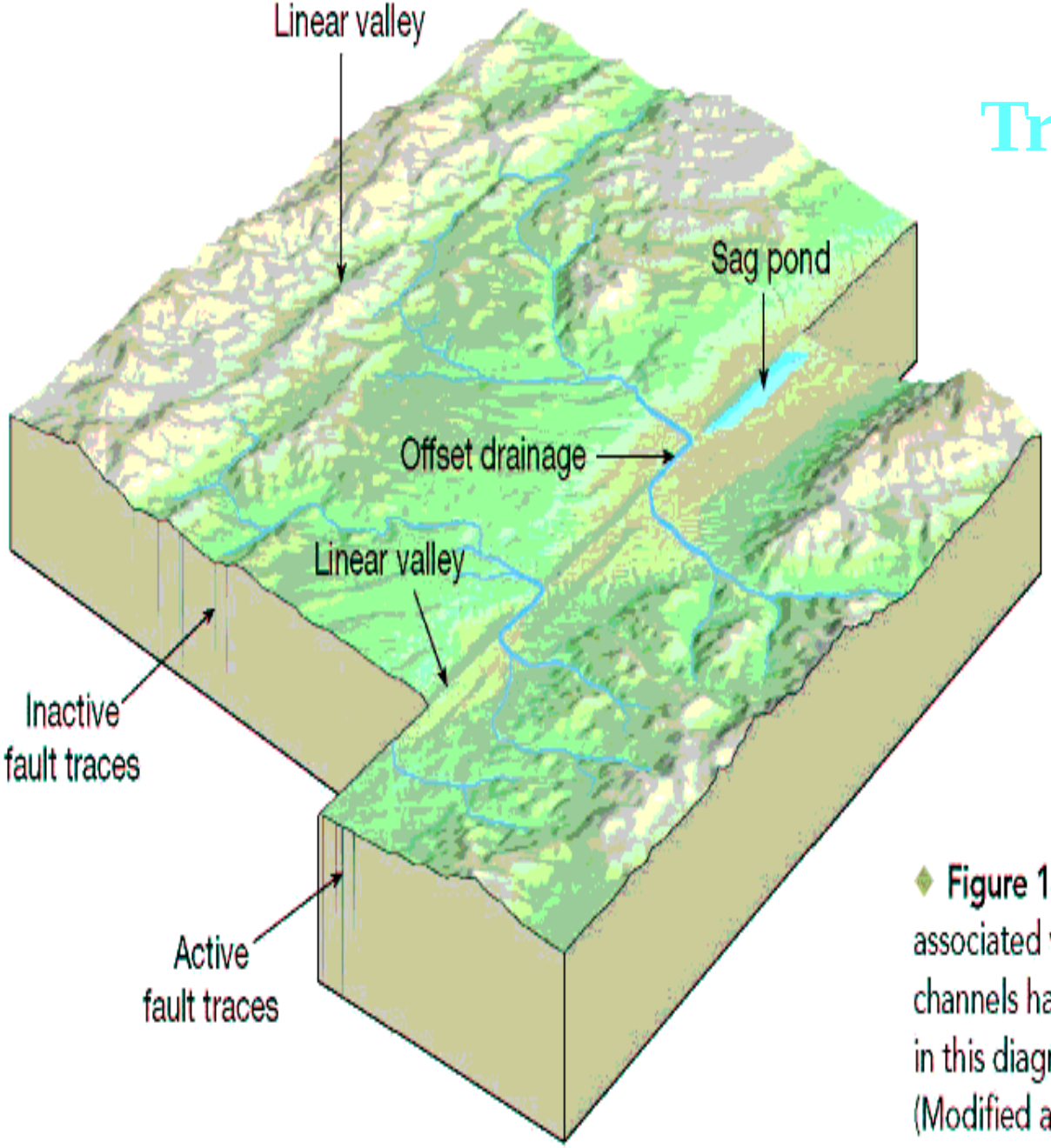
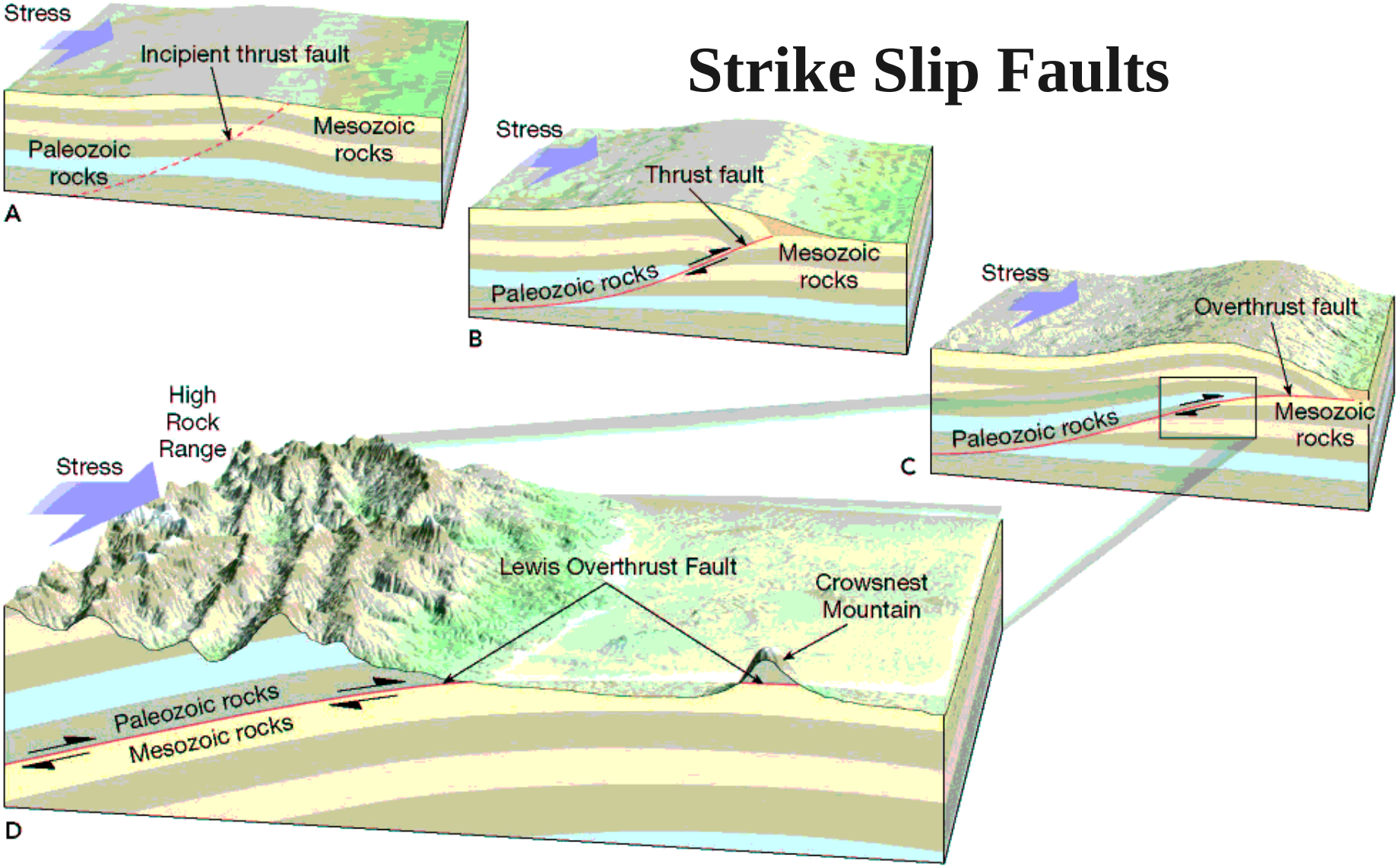


Figure 15.28 Block diagram illustrating the features associated with strike-slip faults. Note how the stream channels have been offset by fault movement. The faults in this diagram are right-lateral strike-slip faults. (Modified after R. L. Wesson and others)

Strike Slip Faults

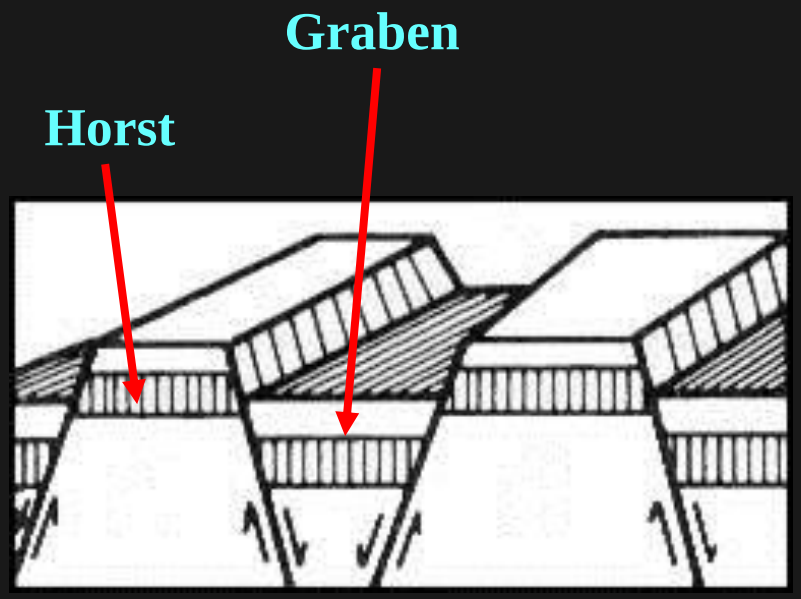


◆ **Figure 15.25** Idealized development of the Lewis Overthrust fault in Glacier National Park. **A.** Geologic setting prior to deformation. **B.**, **C.** Large-scale movement along a thrust fault displaced Paleozoic rock over Mesozoic strata in the region of the Crowsnest Pass, Alberta. **D.** Erosion by glacial ice and running water sculptured the thrust sheet into a majestic landscape and isolated remnants of the thrust sheet such as Crowsnest Mountain.

The Horst and Graben

Horst

- An uplifted block of crust bounded by two normal faults.
- Caused by tensional forces.



Graben

- A valley formed by the downward displacement of a block of crust bounded by two faults.
- Caused by tensional forces.

Folds

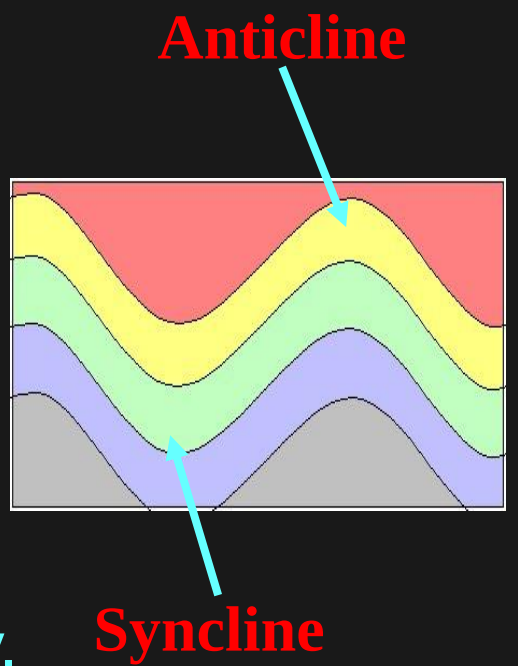
Parts of a Fold include;

1) **Anticline**

- Caused by compressional forces.
- Crust moves upward forming a hill.
- Referred to as an up-fold.

2) **Syncline**

- Caused by Compressional forces.
- Crust moves down forming a valley.
- Referred to as a down-fold.



3) **Limbs**

- side part of a syncline or anticline

4) **Fold Axis**

- Point where limbs change angle of dip.

5) **Strike**

- Direction of fold (axis)

6) **Dip**

- Angle of limb with the horizontal.

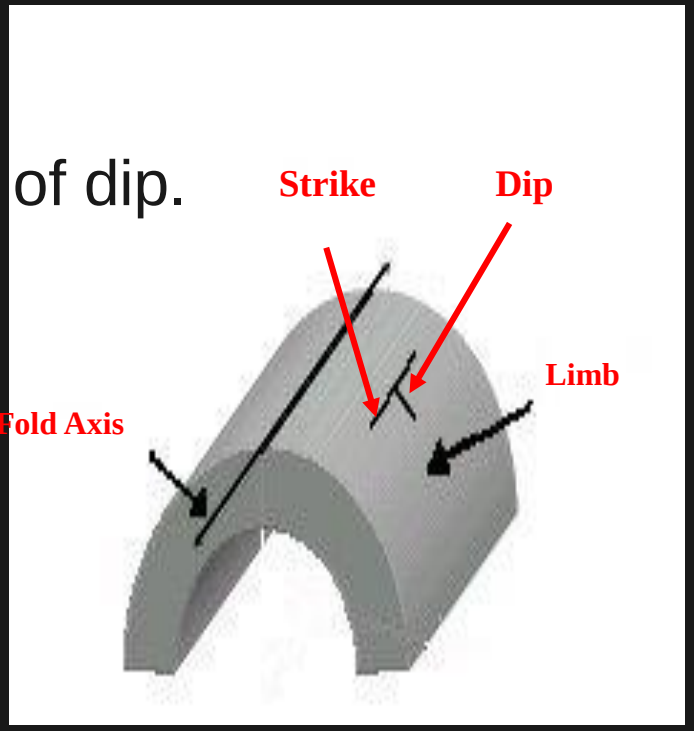
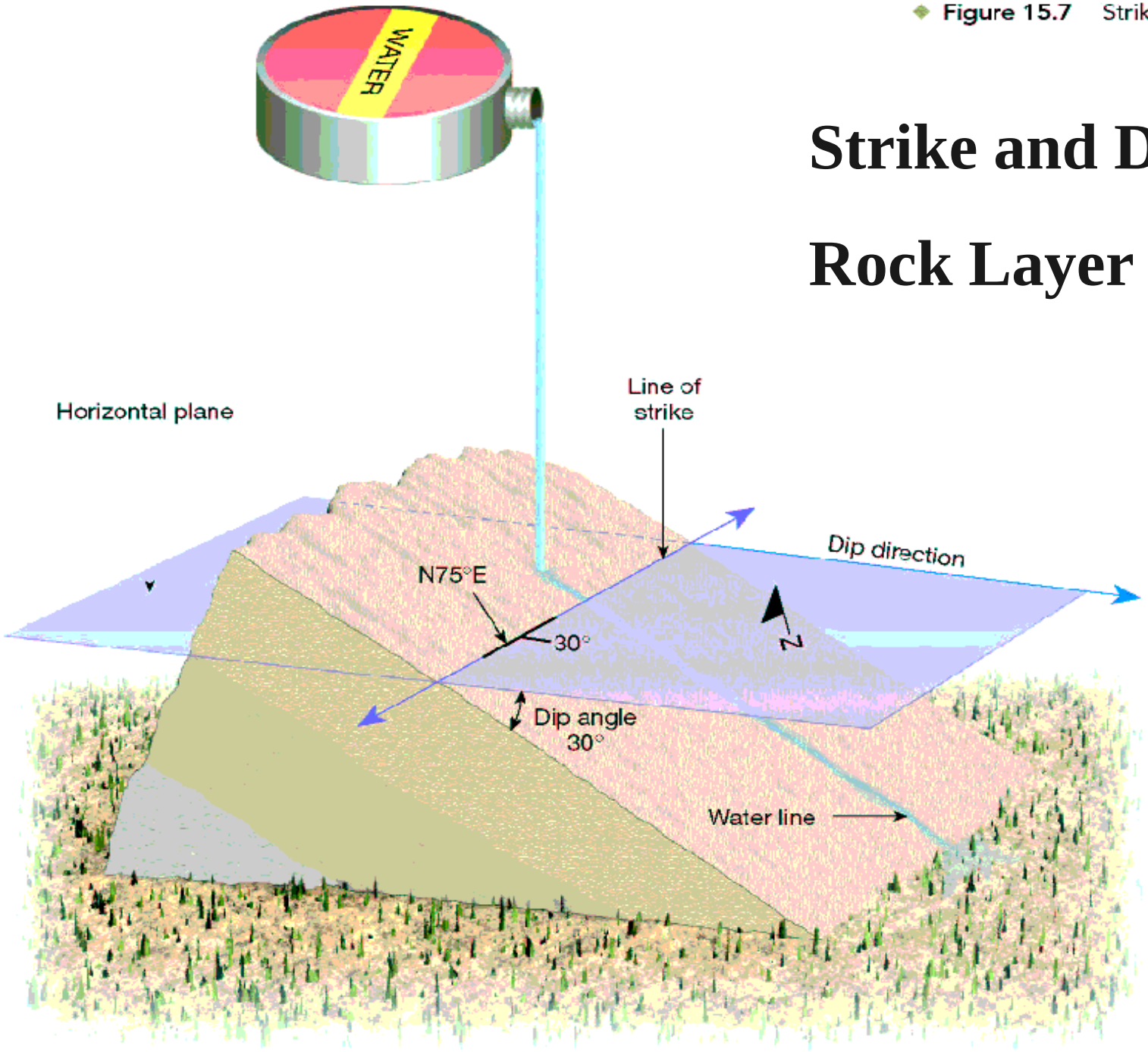


Figure 15.7 Strike and dip of a rock layer.

Strike and Dip of a Rock Layer

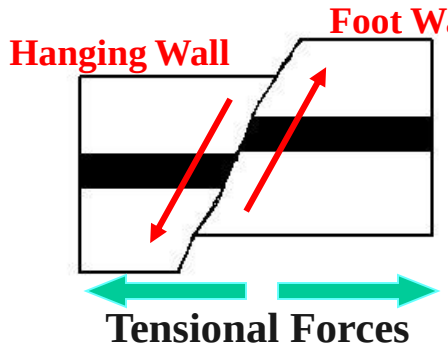


Sample problem

With the aid of a clearly labelled diagram, describe the difference between a normal fault and a reverse fault.

Answer:

A normal fault is formed when tensional forces cause movement within Earth's crust. The hanging wall moves down with respect to the foot wall.



A reverse fault is formed when compressional forces cause movement within Earth's crust and the hanging wall move up in relation to the foot wall.