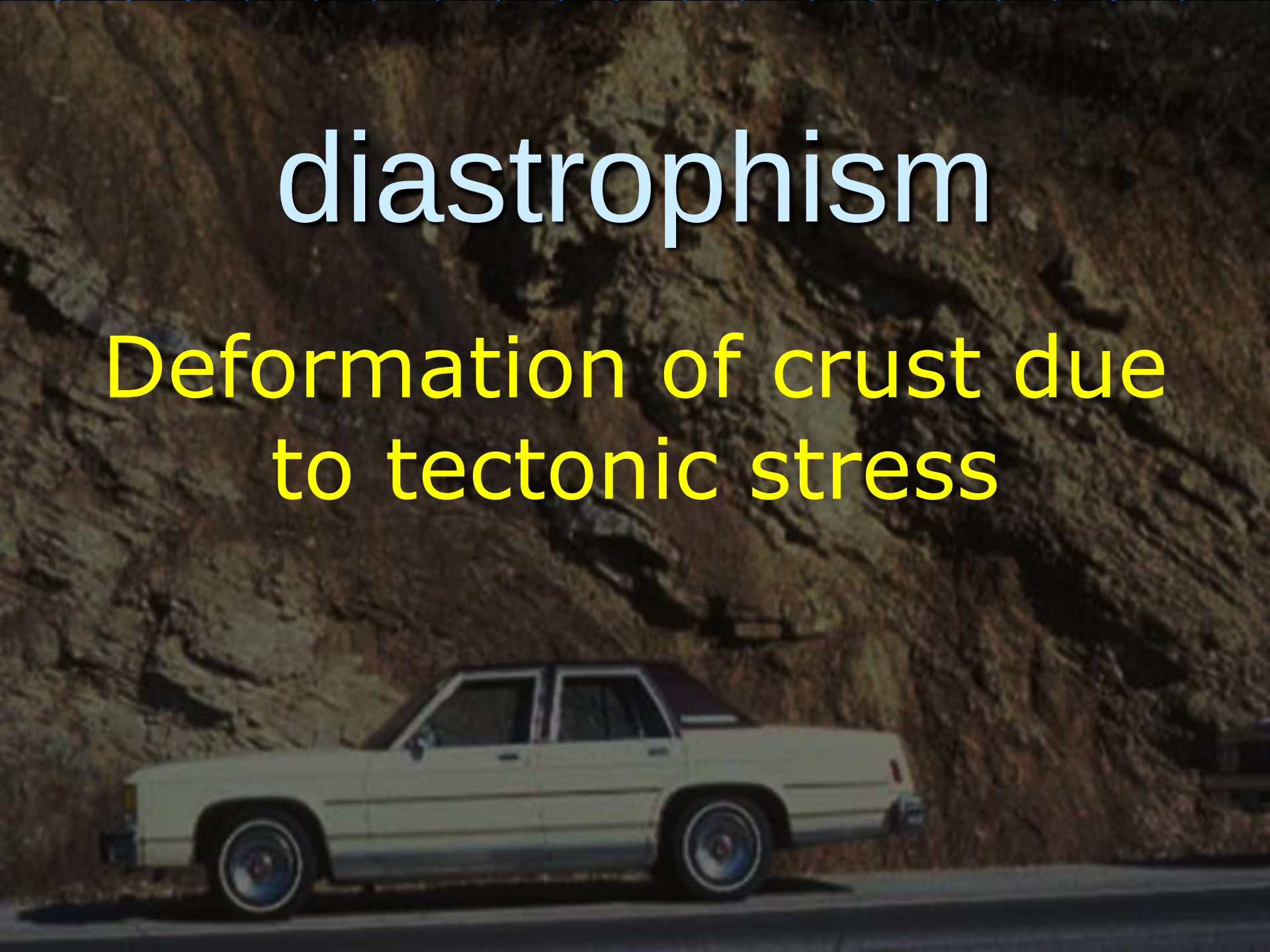
Diastrophism

A. Direction of Forces and the Movements
B. Effects of Diastrophism
C. Causes of Diastrophism

diastrophism

Deformation of crust due to tectonic stress



Types of Stress and Strain

(*Stress* is force acting on rock;
strain is rock's response to stress)

Compression (shortening)
Tensional (stretching)

Direction of Forces and Movements they produce

1. Upward forces

cause the local or widespread rising or uplift of the crust.

2. Downward forces

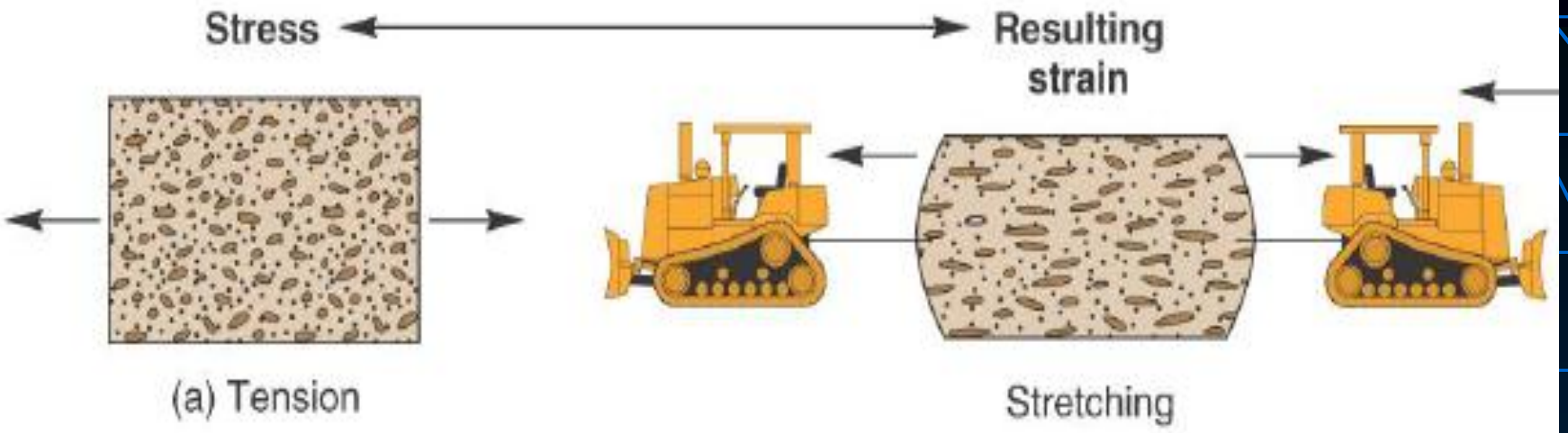
cause the local or widespread sinking or subsidence of the crust.

3. Sideward Forces

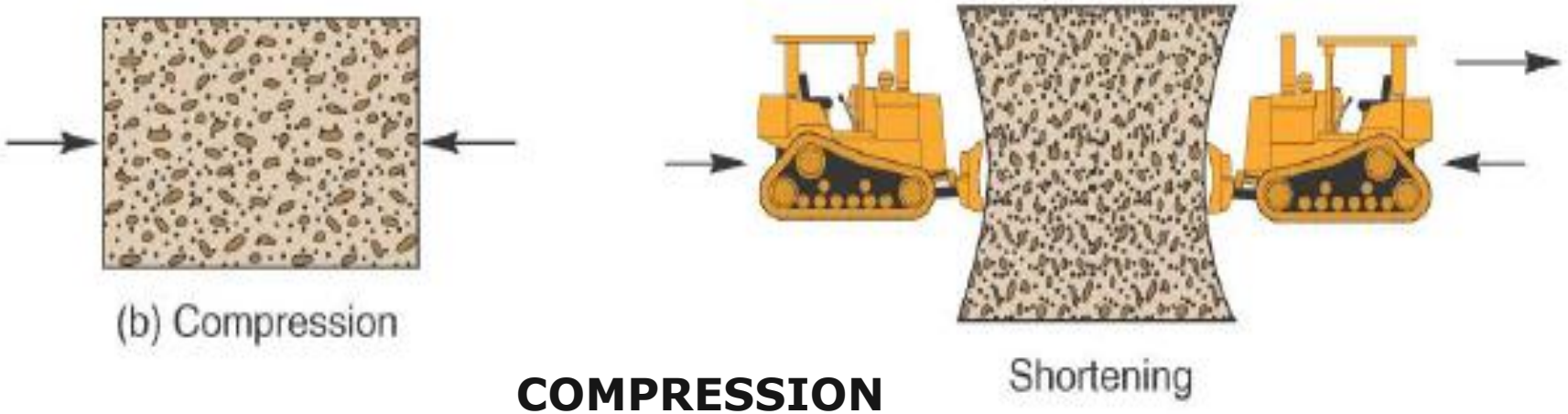
cause the horizontal motion of the crust called a thrust.

Effects of Diastrophism

Folding and Faulting



EXTENSION

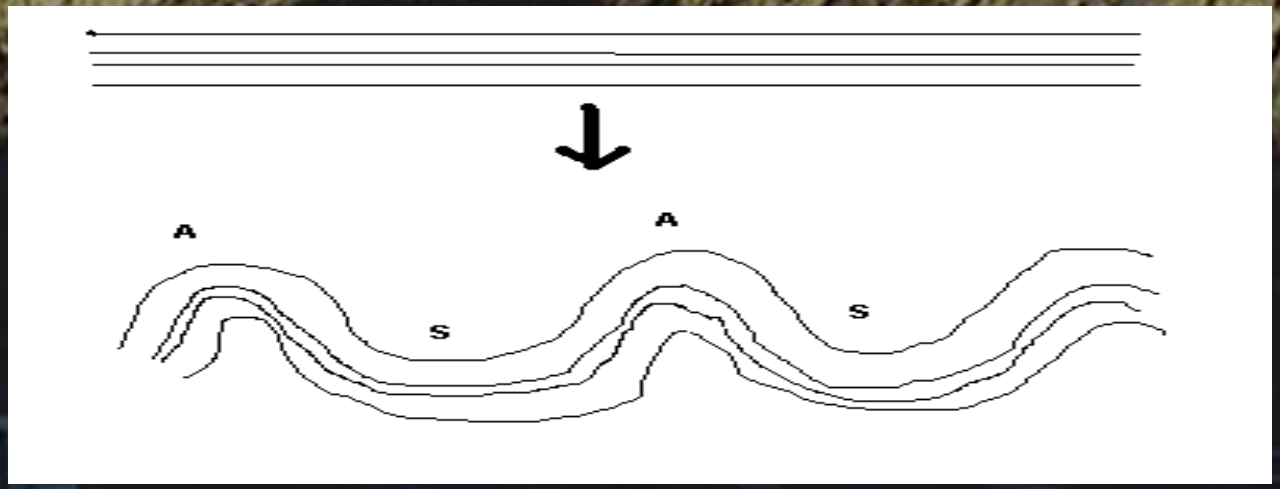


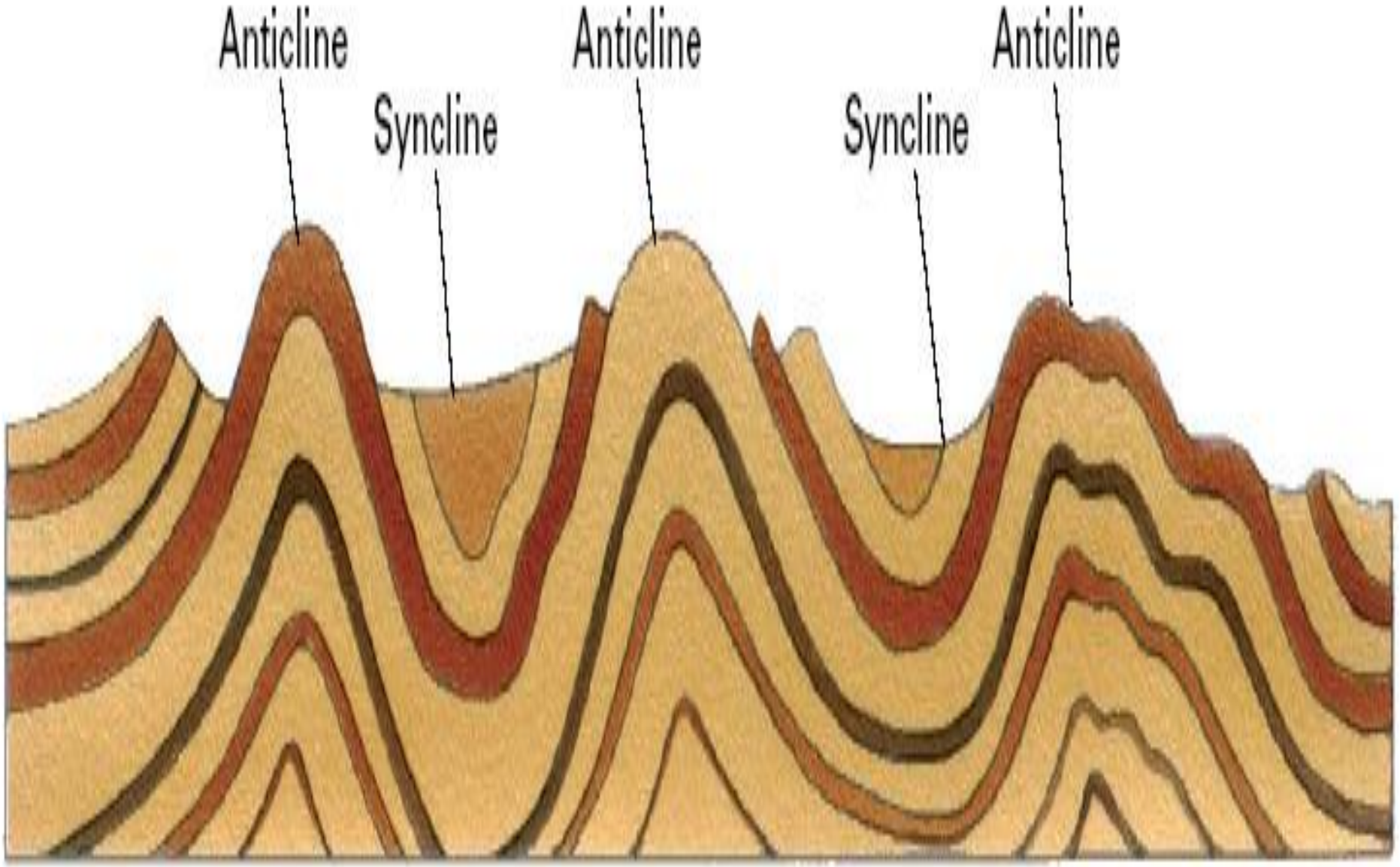
COMPRESSION

Folding

Compressional stress causes rocks to buckle and fold

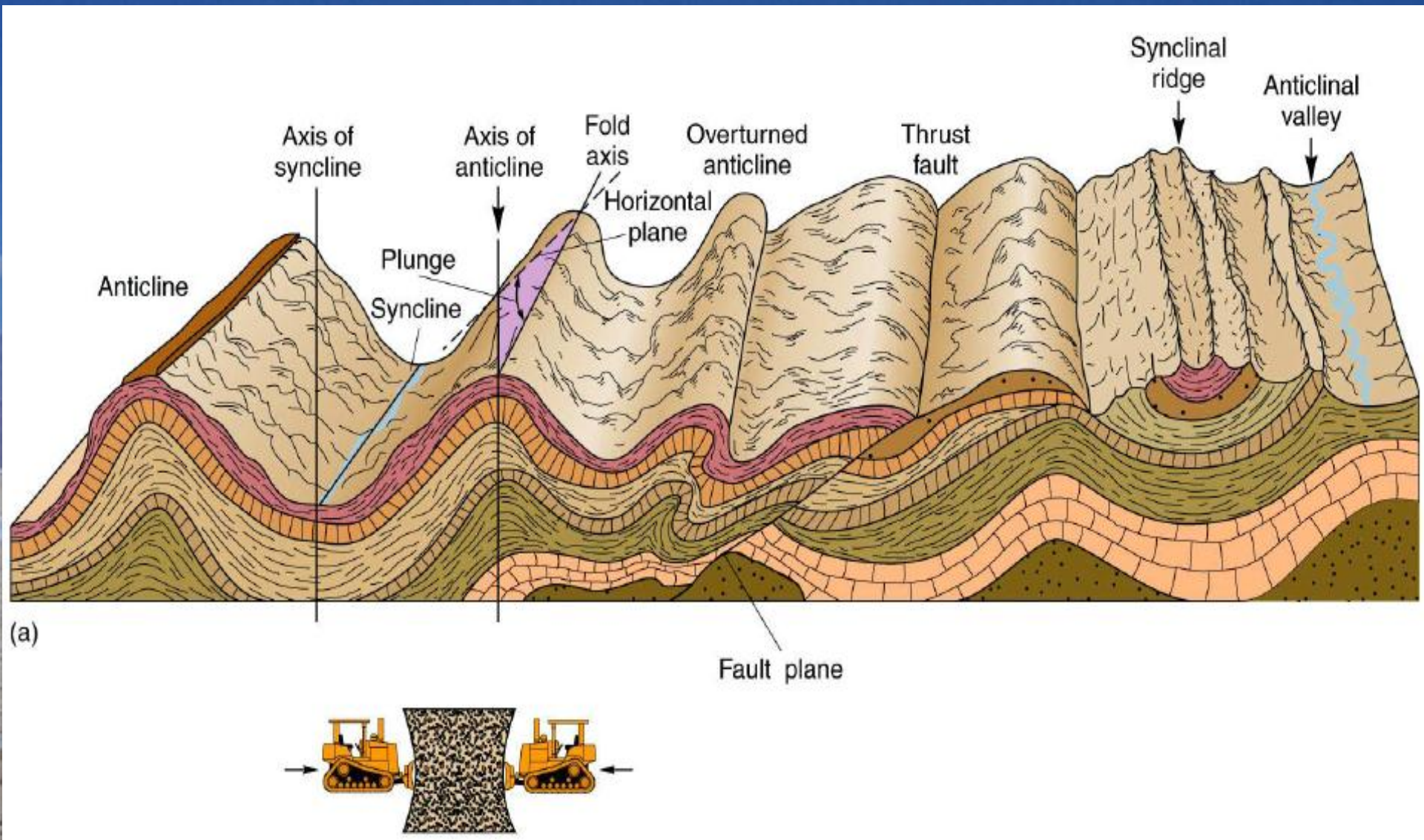
- **Anticline:** arch-shaped fold
- **Syncline:** sink-shaped fold





Anticlines begin as ridges ; synclines begin as valleys.

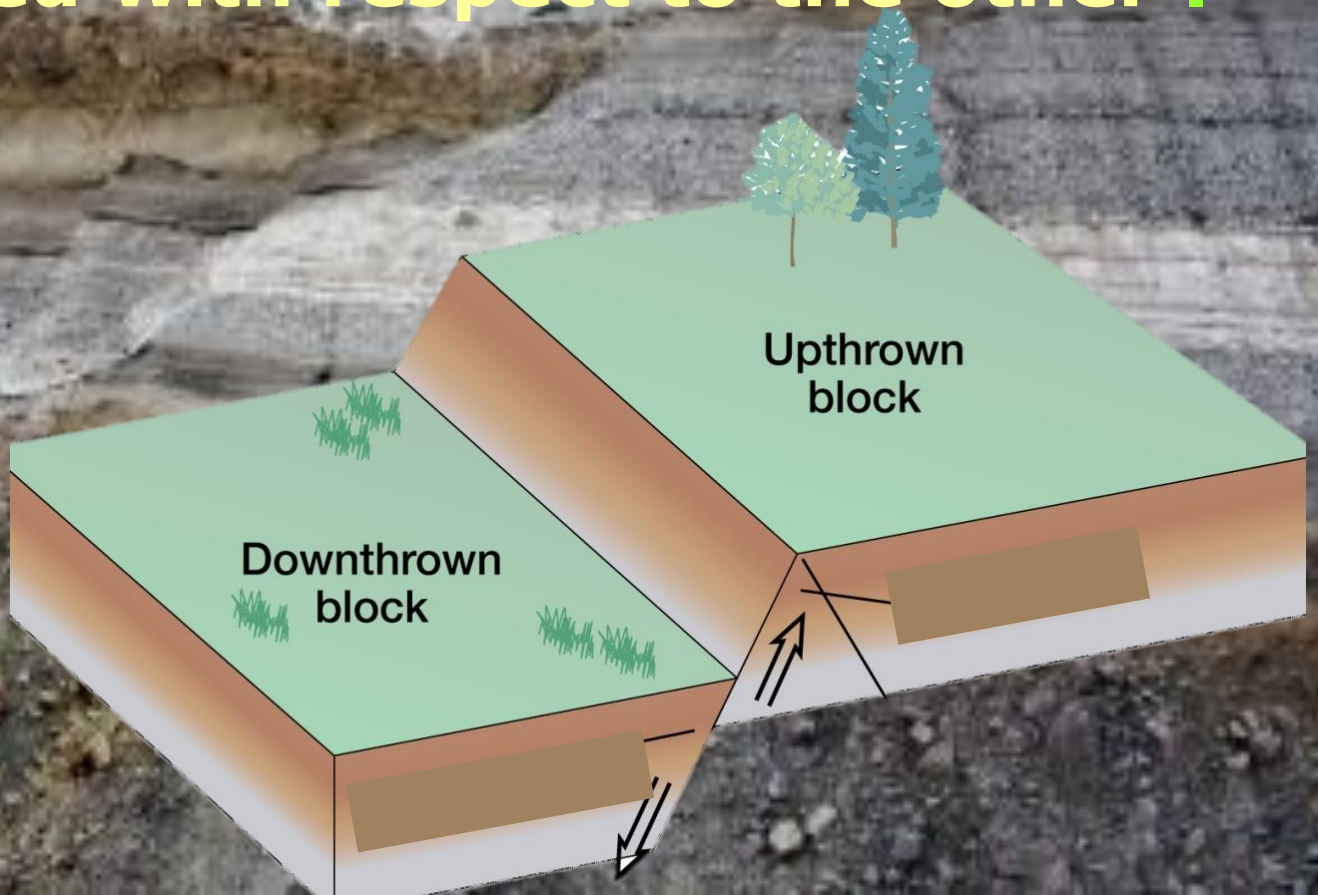
(a)


Synclinal ridge
Anticlinal valley
Axis of syncline
Axis of anticline
Fold axis
Overturned anticline
Thrust fault
Horizontal plane
Plunge
Anticline
Syncline
(a)
Fault plane


What’s this?
Synclinal mountain/ridge

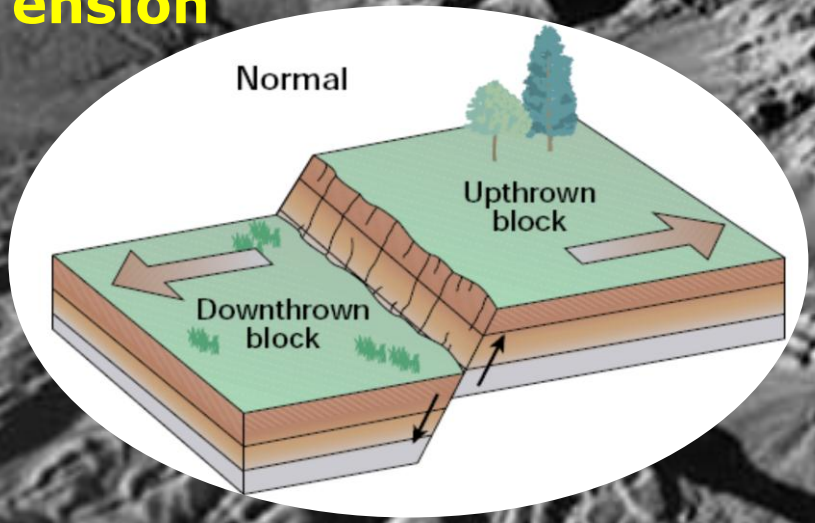
Faulting

Rock is strained beyond ability to remain intact; rock fractures; one side is displaced with respect to the other .

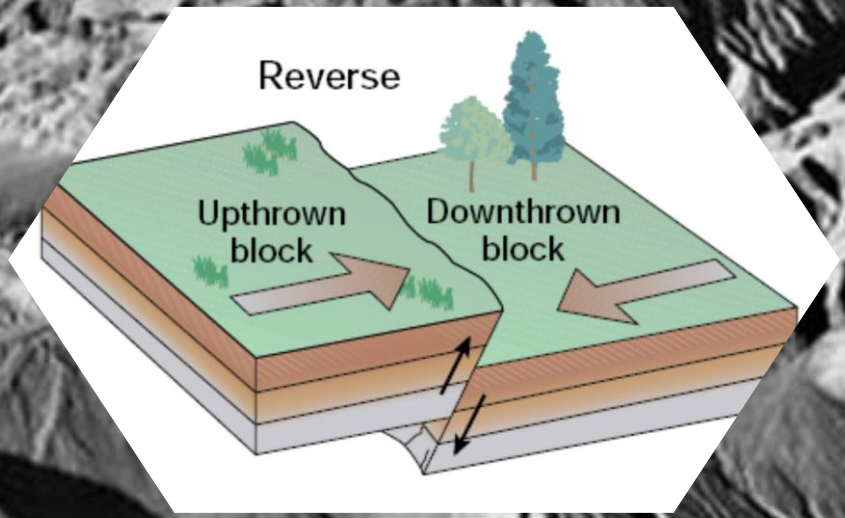


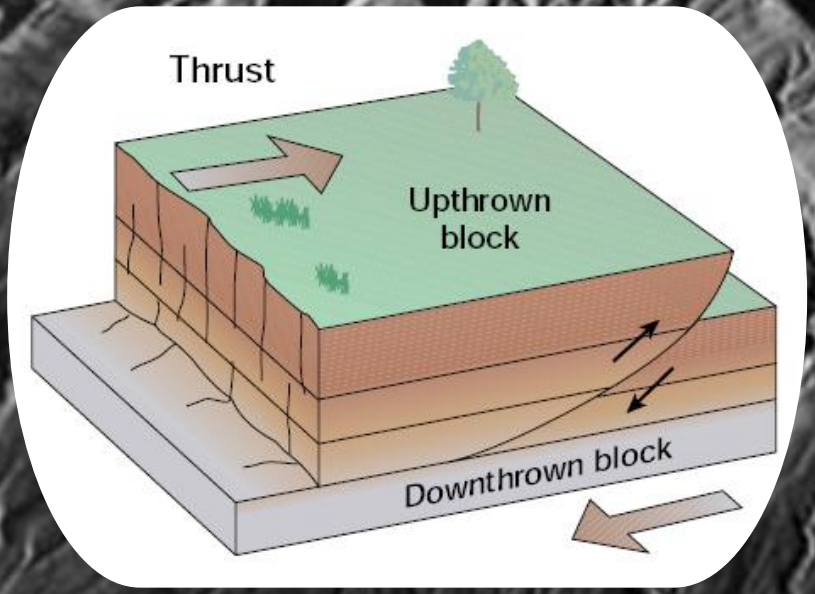
Types of Faults

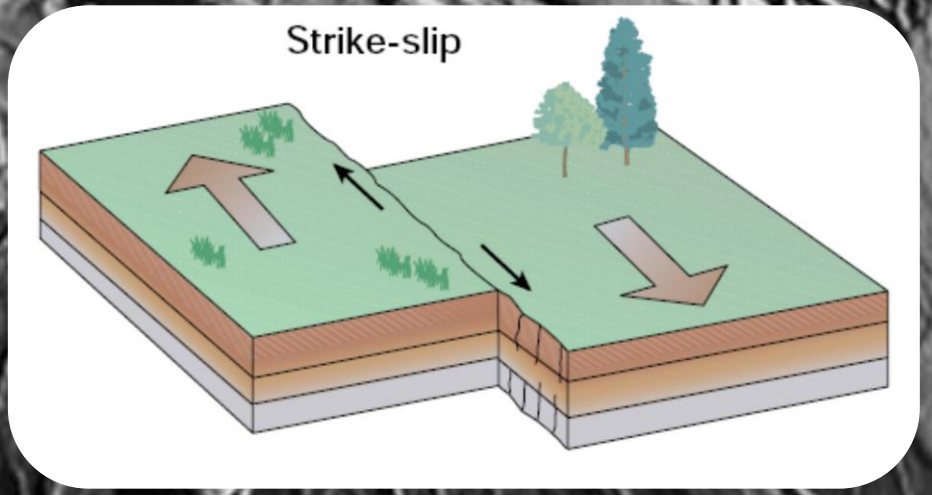
Tension



Compression

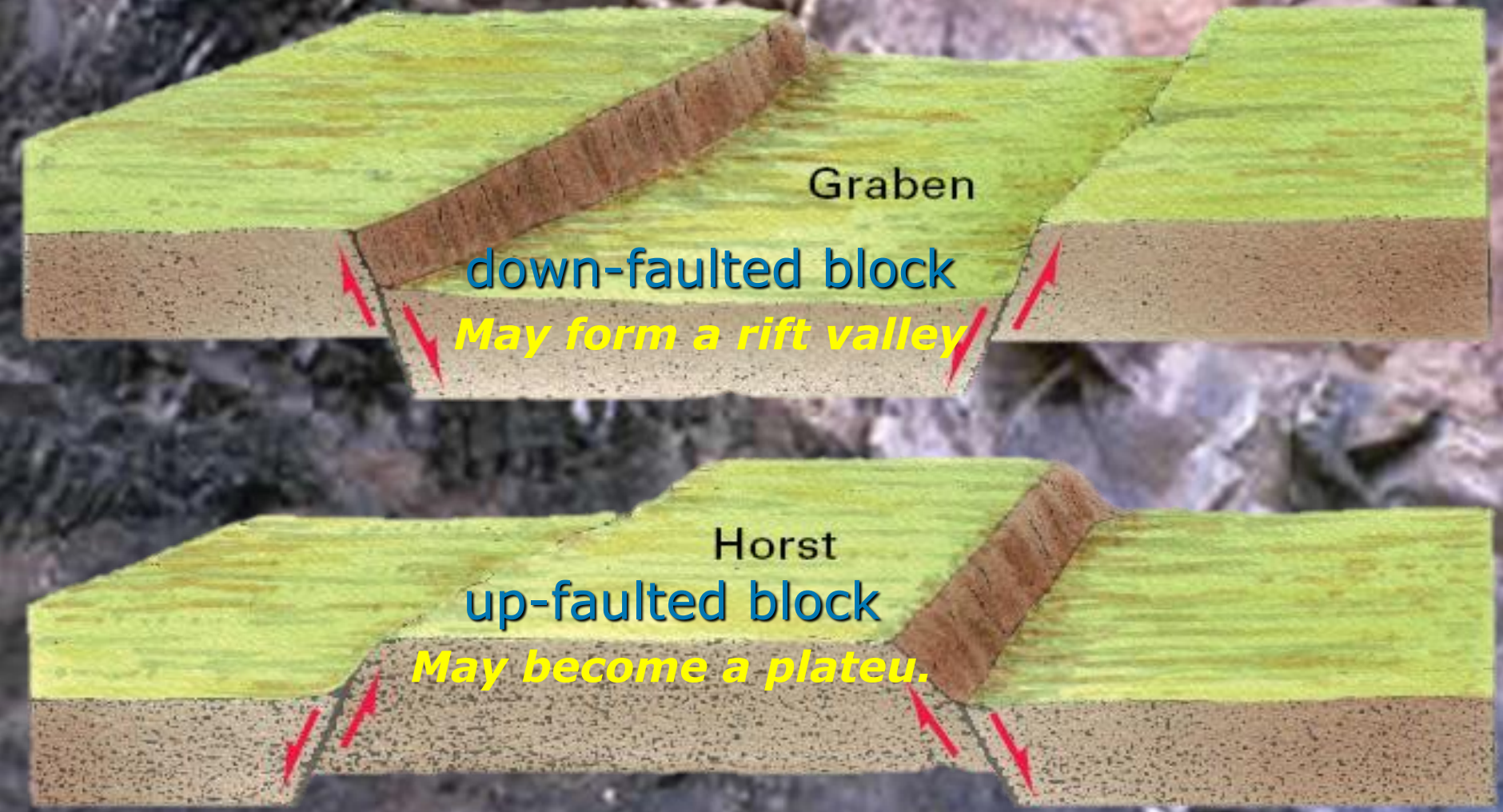


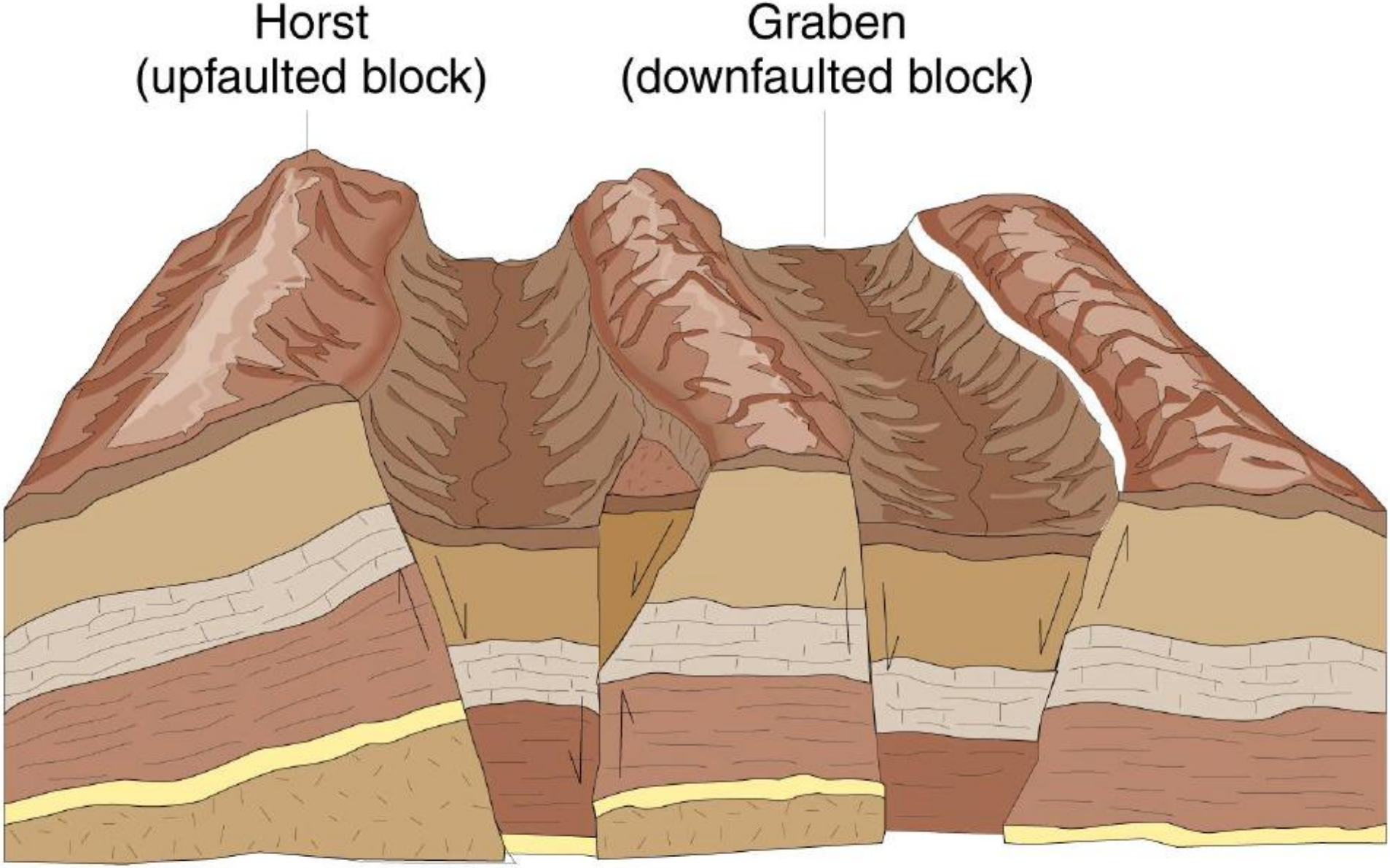




Horst and Graben

(result of normal faulting)





(a)

Where do the forces that shape the earth came from?

Causes of Diastrophism

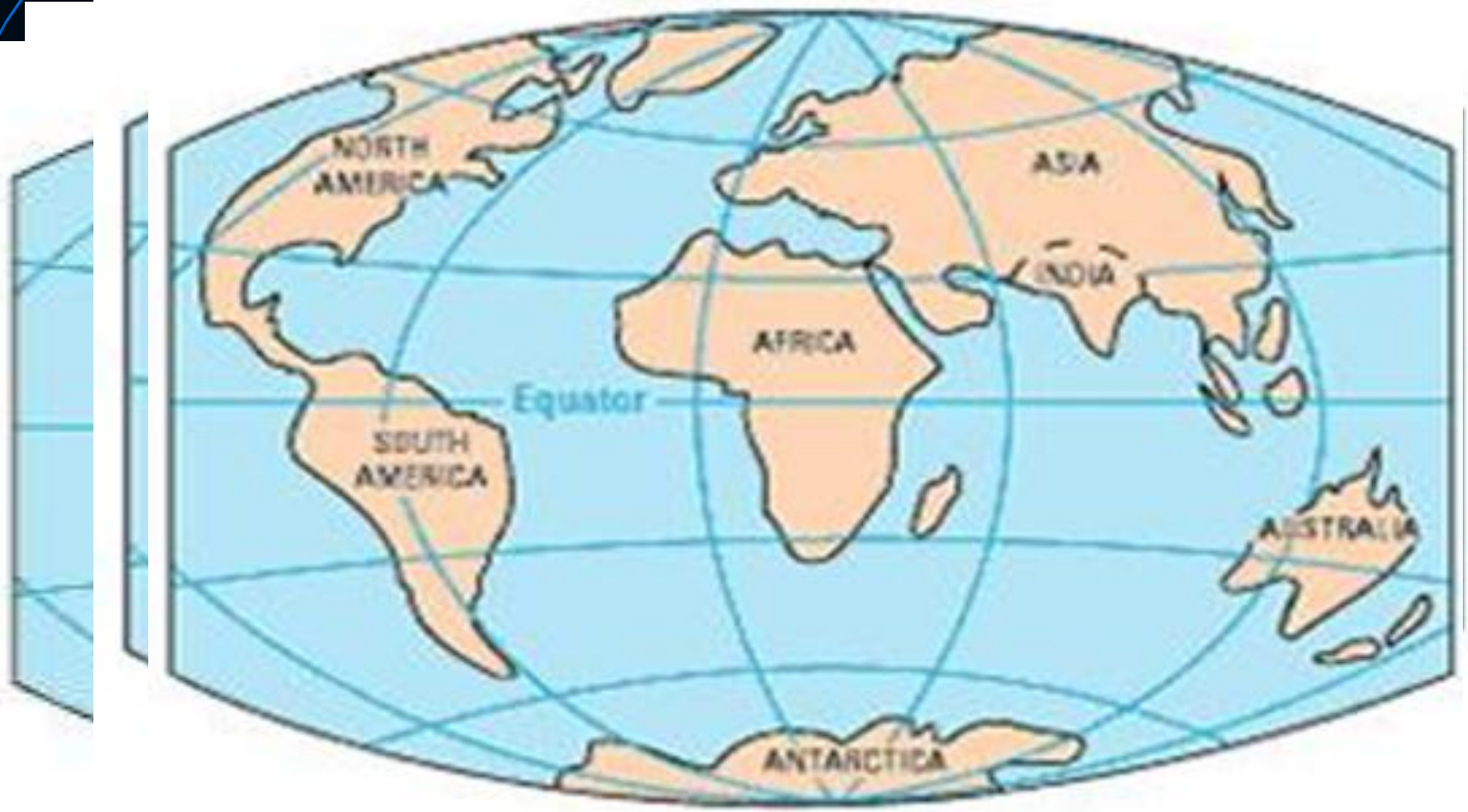
1. Continental Drift Theory
2. Theory of Seafloor Spreading
3. Plate Tectonic Theory

Continental Drift Theory

Proposed by **Alfred Wegener** in 1915

250 million years ago, all of the continents were combined into one super-continent called "**Pangaea**"

The continents gradually drifted apart to where they are today



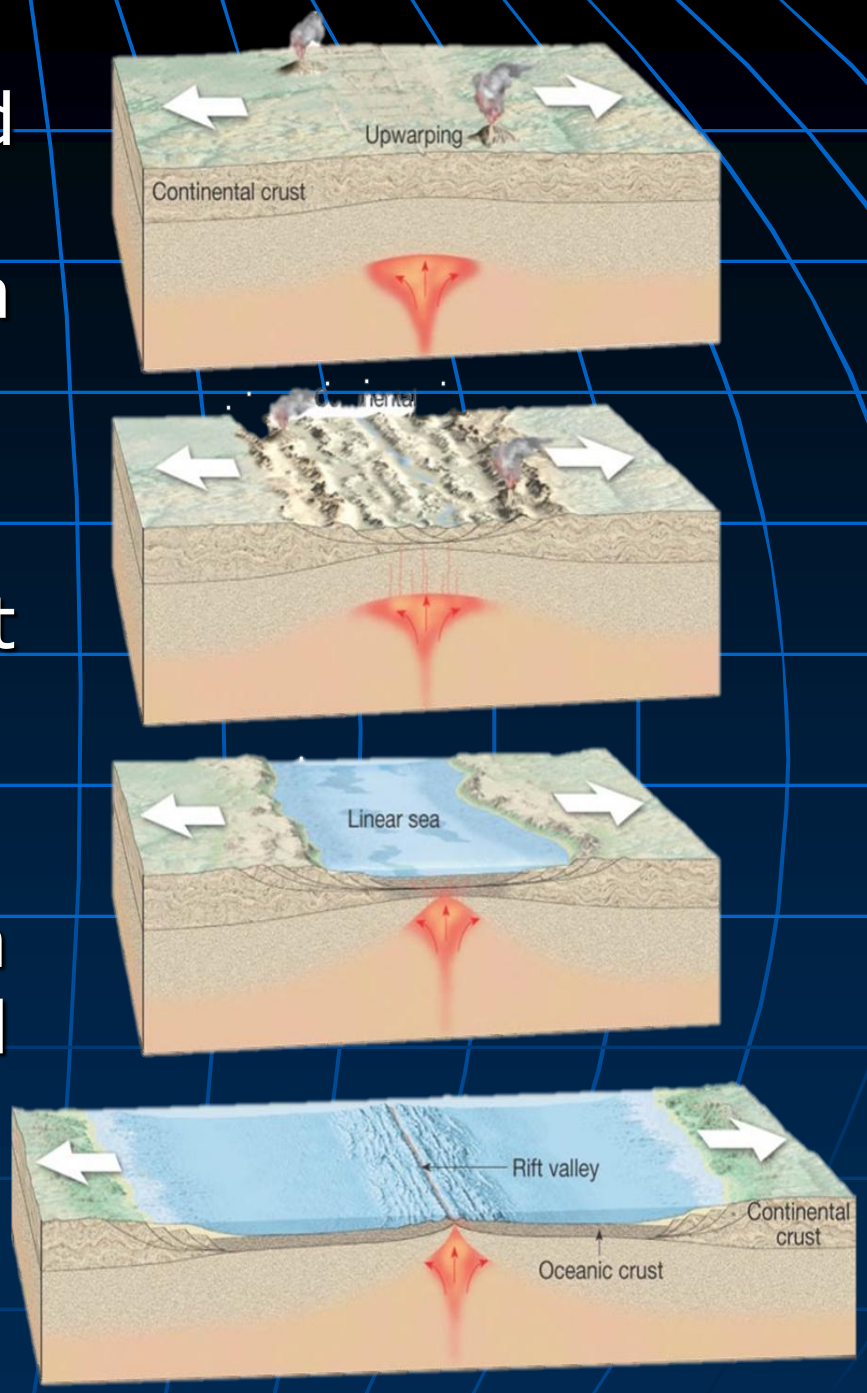
PRESENT DAY

65 million years ago

India was once connected to Antartica and Africa. Then, it collided with Asia forming the Himalayan Mountain Ranges.

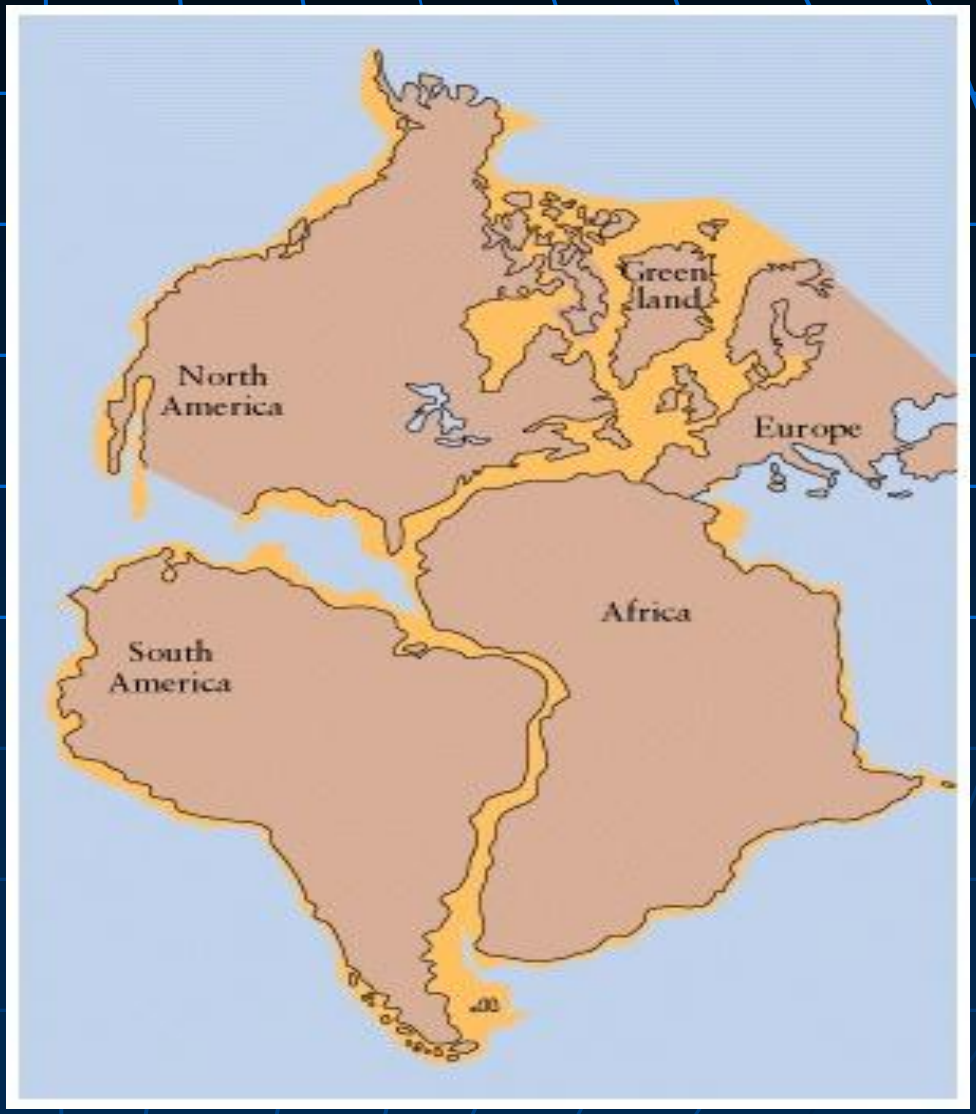
Saudi Arabia drifted apart from Africa forming the RED SEA.

South America and Africa were once connected and with this movement, ATLANTIC OCEAN was formed.



Puzzle Pieces

- Continents look like they could be part of a giant jigsaw puzzle



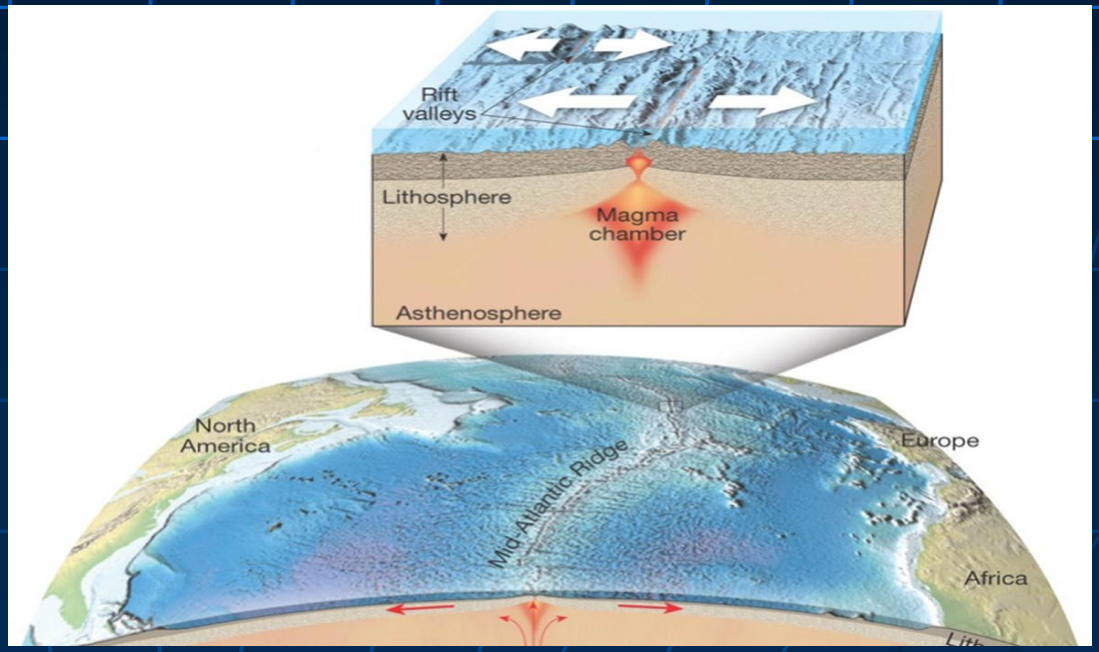
Seafloor Spreading

In 1920, Mid-oceanic ridges were discovered using an echo sounding device like a *sonar*.

A break or rift was found at the middle of the ridge running along its length where basaltic magma wells out to the surface.

This solidified and form a 'new crust'. This new crust pushes the old crust causing the ocean floor to spread.

The ocean floor has been estimated to be spreading at the rate of *5 centimeters per year.*



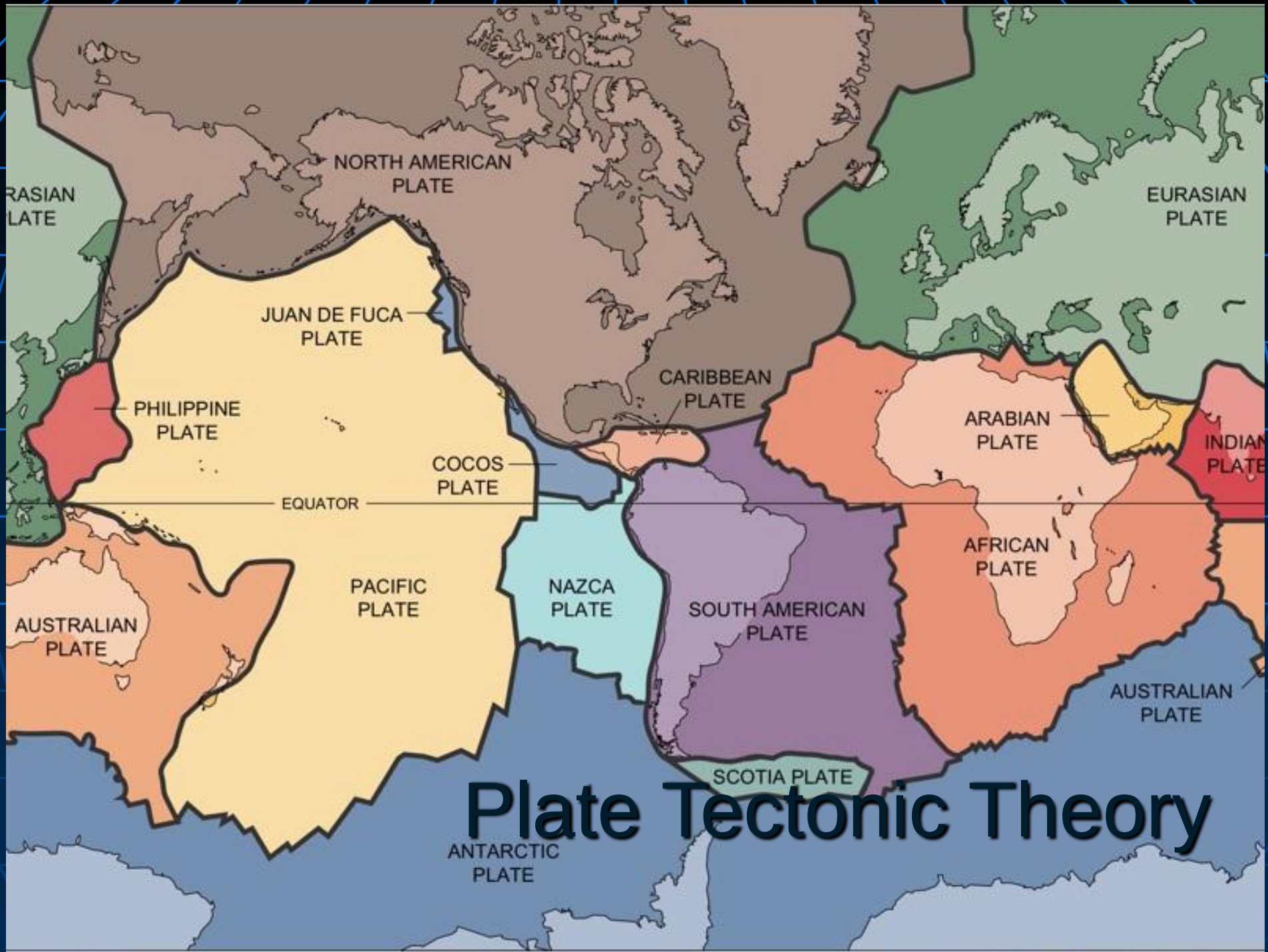
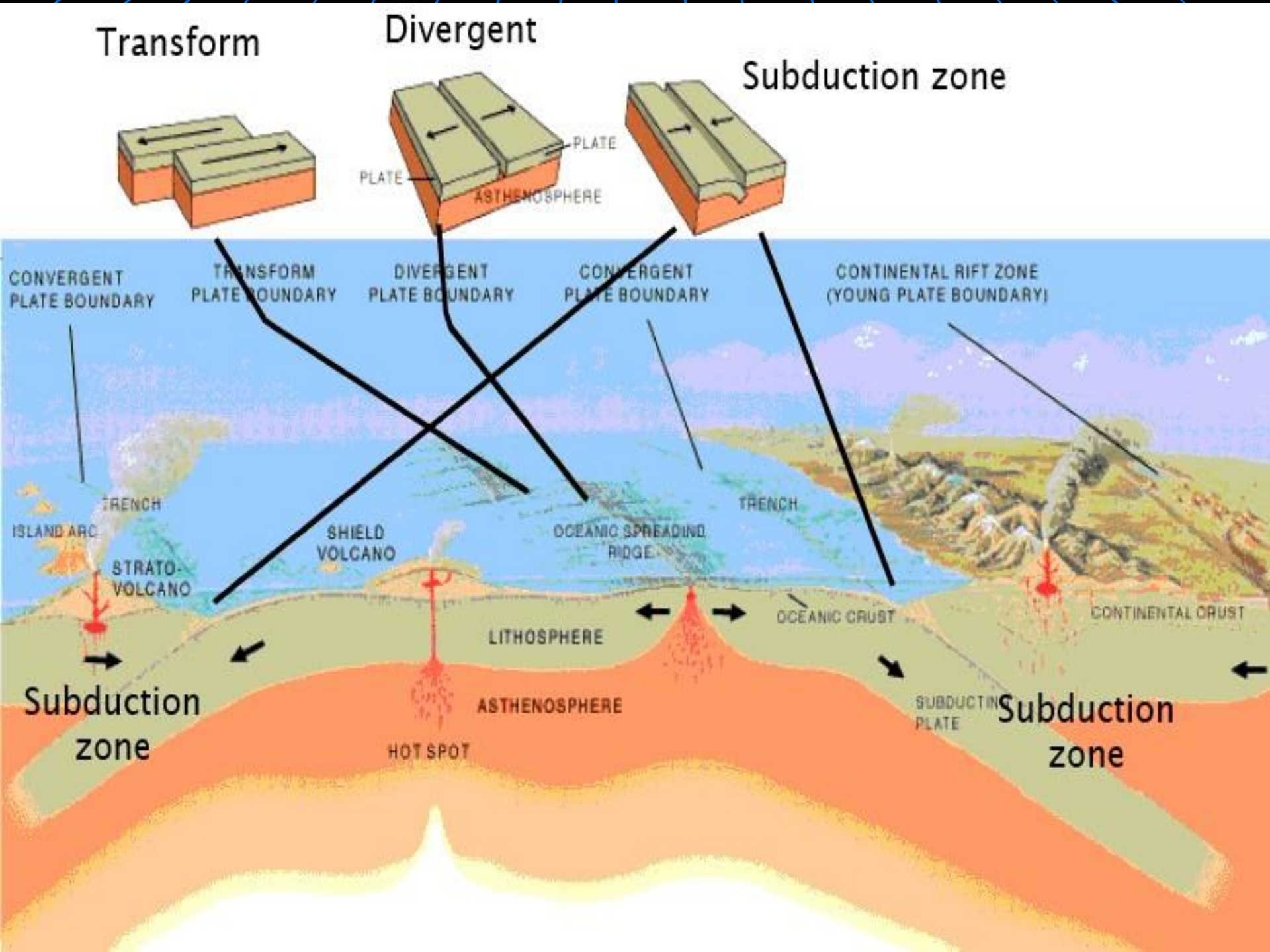

NORTH AMERICAN PLATE
EURASIAN PLATE
JUAN DE FUCA PLATE
CARIBBEAN PLATE
PHILIPPINE PLATE
ARABIAN PLATE
COCOS PLATE
EQUATOR
AFRICAN PLATE
PACIFIC PLATE
NAZCA PLATE
SOUTH AMERICAN PLATE
AUSTRALIAN PLATE
AUSTRALIAN PLATE
SCOTIA PLATE
ANTARCTIC PLATE
Plate Tectonic Theory

Plate Tectonic Theory

Known as the geological structural deformation.

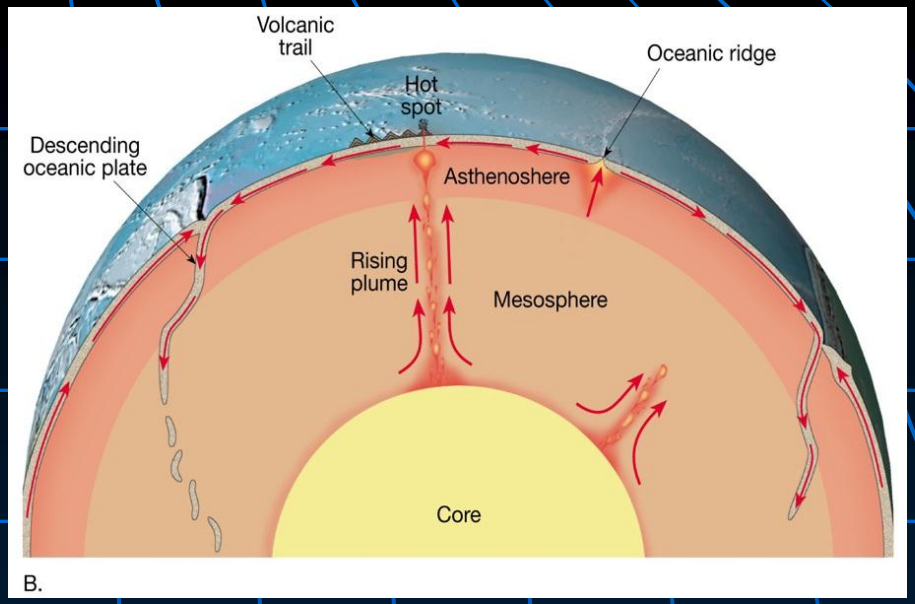
In 1960-1970, James Hall proposed that the lithosphere is divided into 19 semirigid plates. The boundaries of these plates are areas of tectonic activities where volcanic eruptions and earthquakes usually occur.


Transform
Divergent
Subduction zone
PLATE
PLATE
ASTHENOSPHERE
CONVERGENT PLATE BOUNDARY
TRANSFORM PLATE BOUNDARY
DIVERGENT PLATE BOUNDARY
CONVERGENT PLATE BOUNDARY
CONTINENTAL RIFT ZONE (YOUNG PLATE BOUNDARY)
TRENCH
ISLAND ARC
STRATO-VOLCANO
SHIELD VOLCANO
OCEANIC SPREADING RIDGE
TRENCH
OCEANIC CRUST
CONTINENTAL CRUST
LITHOSPHERE
ASTHENOSPHERE
HOT SPOT
SUBDUCTING PLATE
Subduction zone
Subduction zone

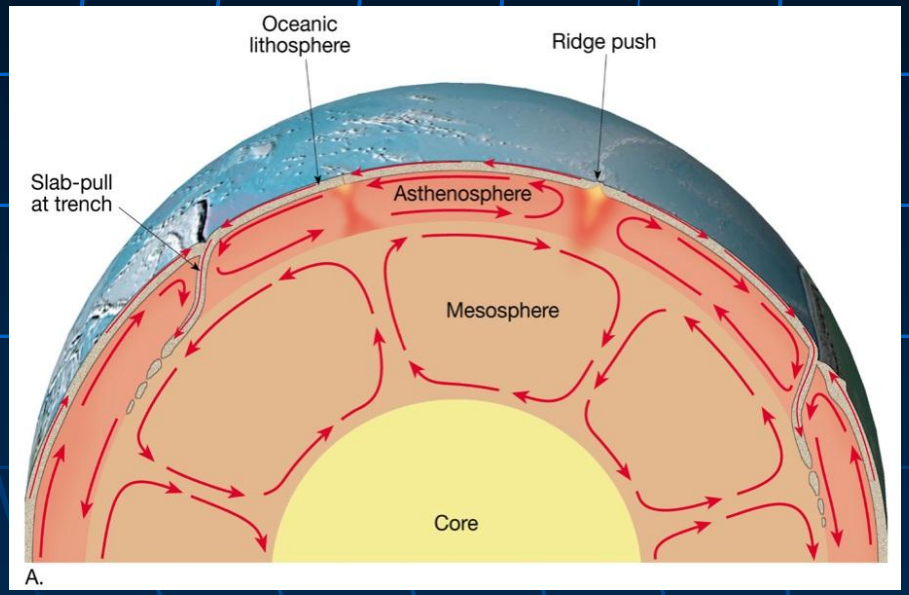
Why do plates move?

- Two related ideas are widely accepted:
- Slab pull: Denser, colder plate sinks at subduction zone, pulls rest of plate behind it.
- Mantle convection: Hotter mantle material rises beneath divergent boundaries, cooler material sinks at subduction zones.
- So: moving plates, EQs, & volcanic eruptions are due to Earth's loss of internal heat.

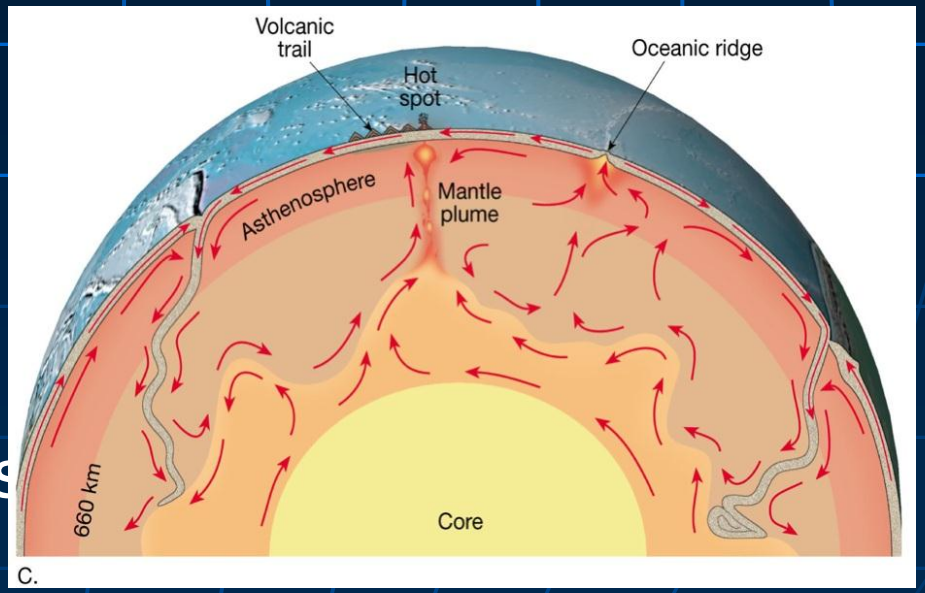
How does convection work? No one knows—but they aren't afraid to propose models!



Whole-mantle convection



Two mantle convection cells



Complex convection

Continental Drift + Sea Floor Spreading = Plate Tectonics