Section 12-1

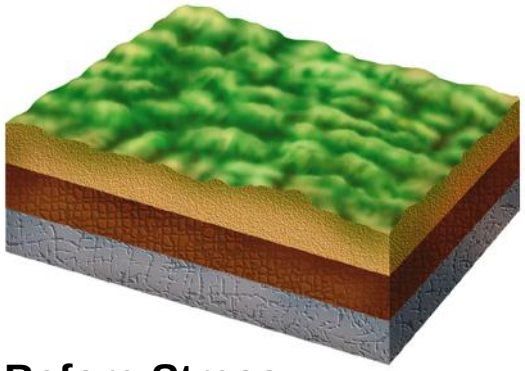
Earth's Crust in Motion

Faults

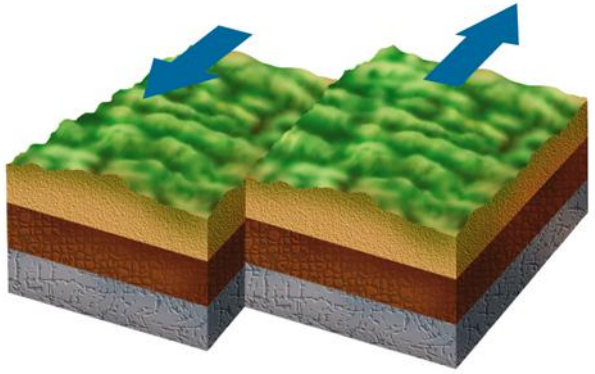
Three different kinds of Stress:

- **shearing**
  - Stress that pushes a mass of rock in 2 opposite directions.
- **tension**
  - The stress force that pulls on the crust, stretching it so it becomes thinner.
- **compression**
  - The stress force that squeezes rock until it folds or breaks.

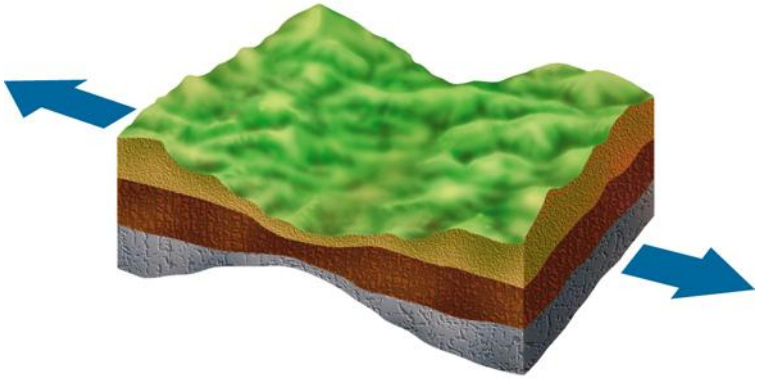
Faults



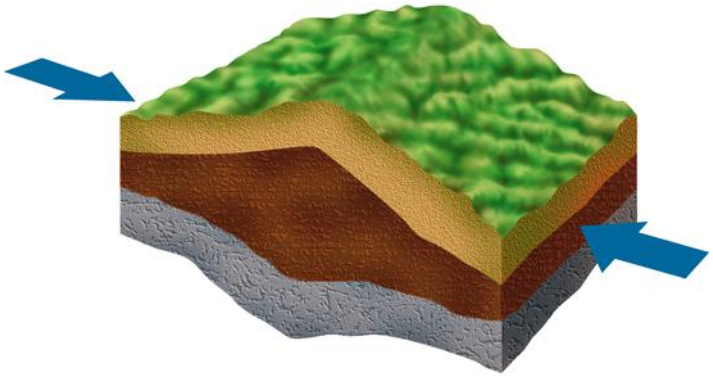
Before Stress



Shearing



Tension



Compression

Faults

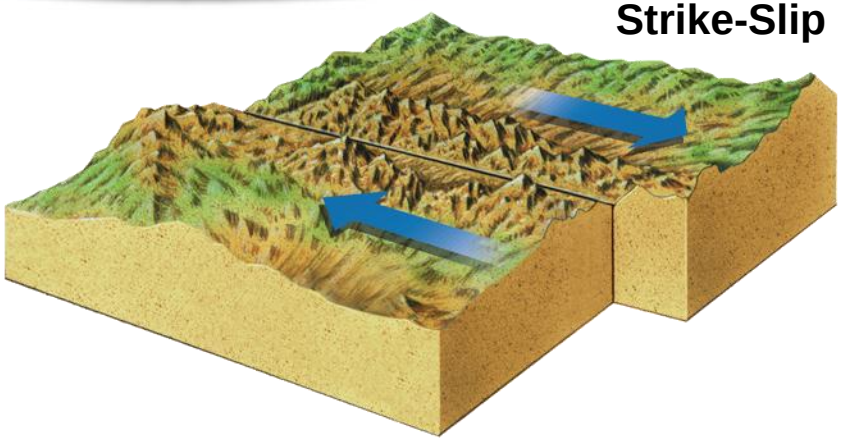
SCIENCE EXPLORER

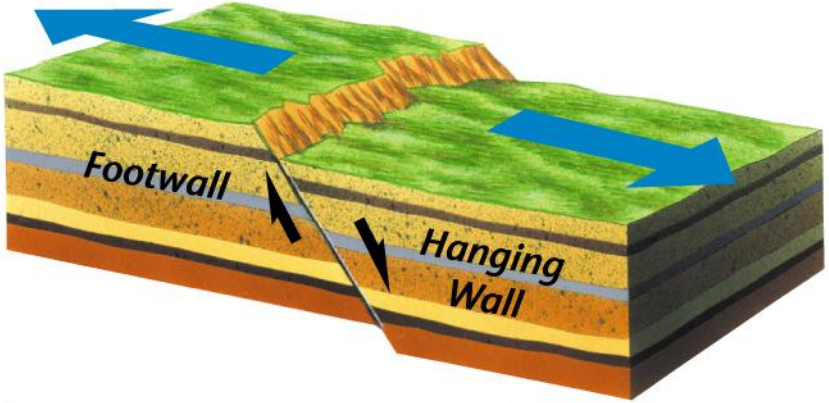
Three different kinds of Faults:

- **Strike-Slip Faults**
  - Created by shearing
- **Normal Faults**
  - Created by tension
- **Reverse Faults**
  - Created by compression

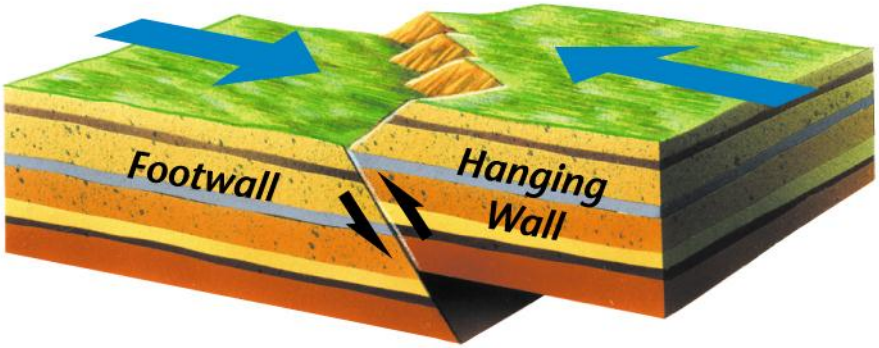
Faults

Strike-Slip Fault

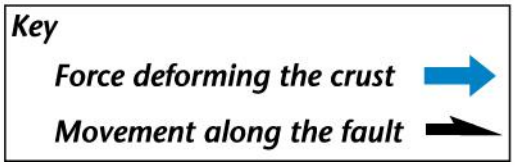




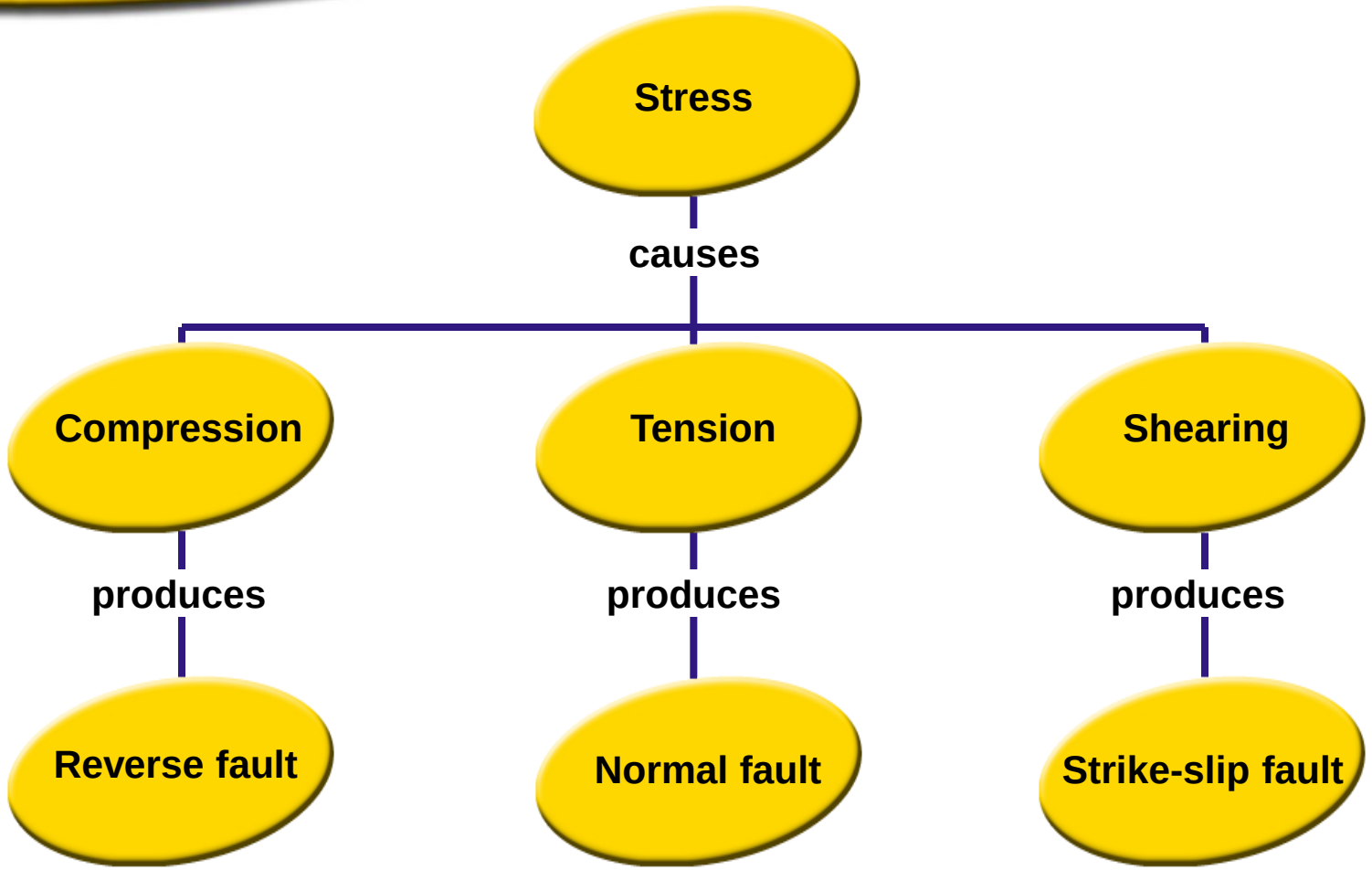
Normal Fault



Reverse Fault



Faults



Mountain Building:

- **Mountains formed by Faulting:**
  - When normal faults uplift a block of rock, a fault-block mountain forms.
- **Mountains formed by Folding:**
  - The collision of two plates can cause compression and folding of the crust.

Anticlines and Synclines:

- **Anticline:**
  - A fold in the rock that bends upward into an arch.
- **Syncline:**
  - A fold in the rock that bends downward to form a bowl.

Section 12-2

Measuring Earthquakes

Earthquakes

SCIENCE EXPLORER

An earthquake happens when rocks break deep inside the Earth's crust.

Unscramble the letters below to make the three words associated with earthquakes:

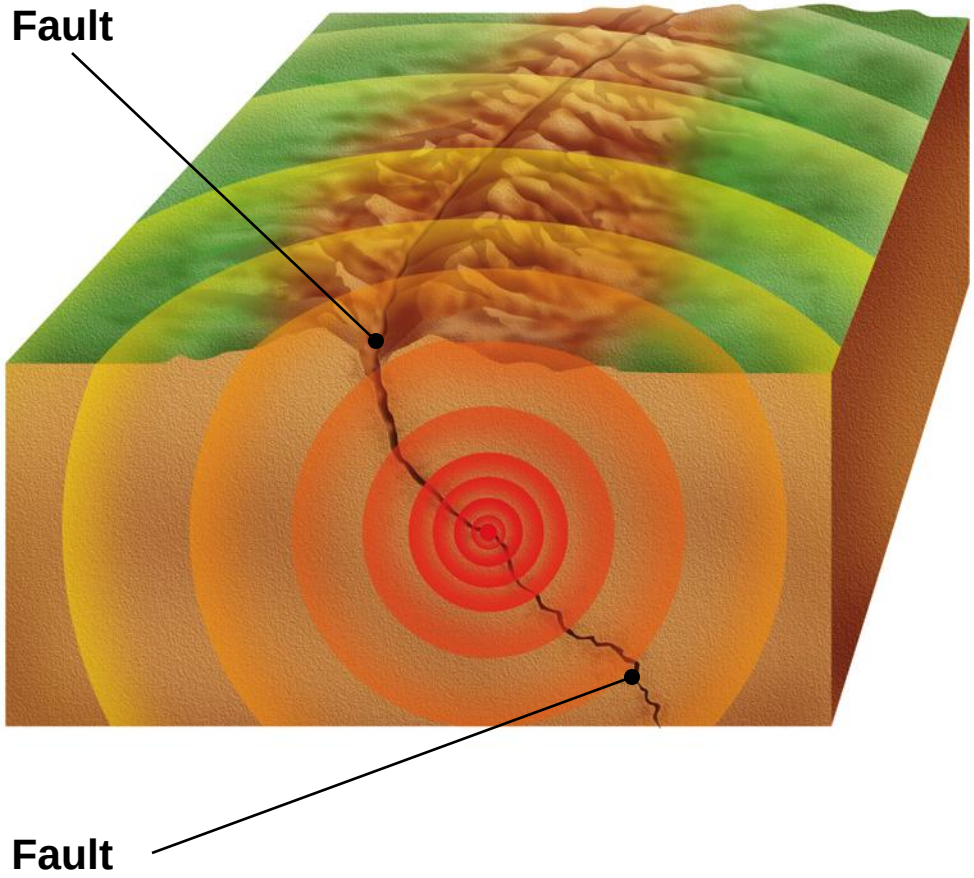
FTLUA
KACFOTHESR
REEPTINCE

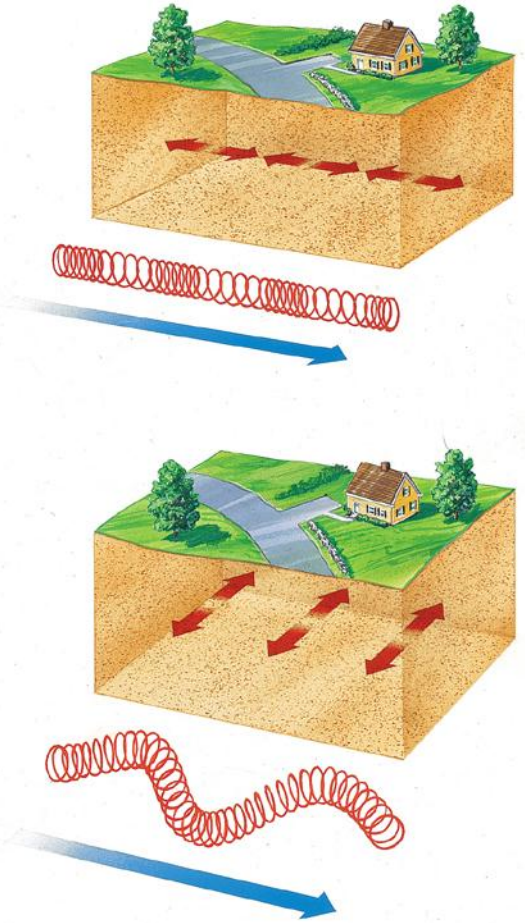
Fault
Aftershock
Epicenter

Three categories of Seismic Waves:

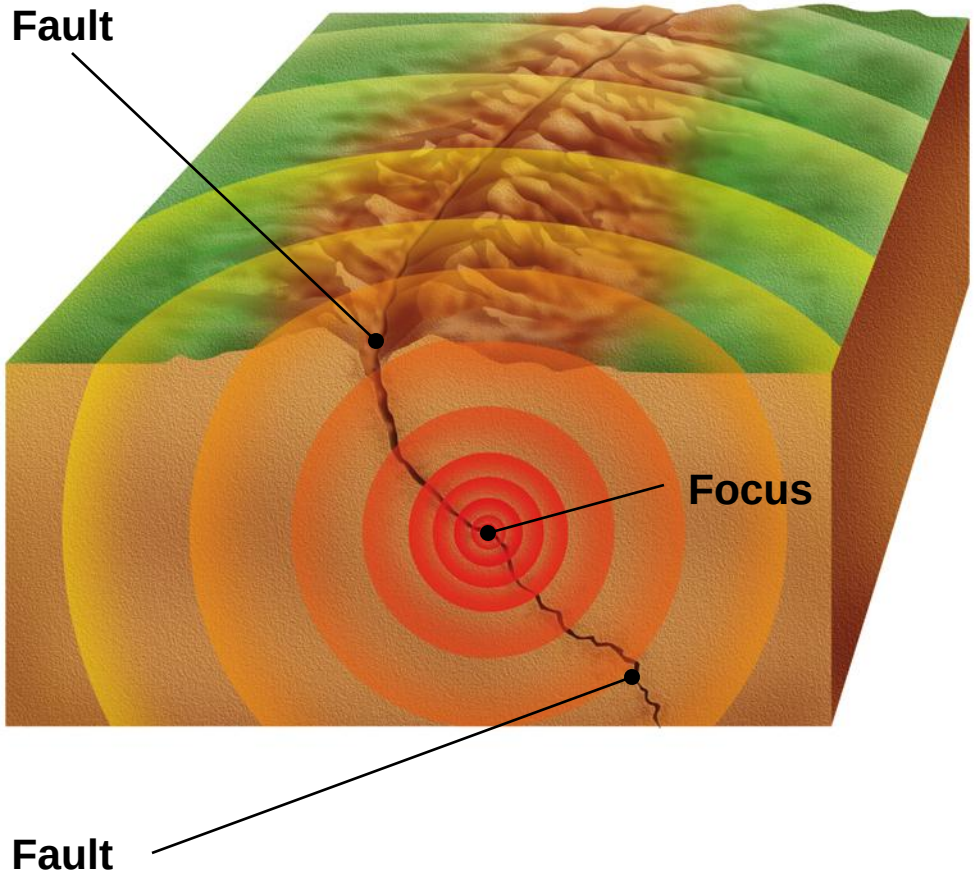
- **P waves**
  - Primary waves – the first waves to arrive – compression waves
- **S waves**
  - Secondary waves – arrive after P waves – move side to side as well as up and down
- **Surface waves**
  - When P waves and S waves reach the surface, some of them are transformed into surface waves. Surface waves make the ground roll or shake from side to side.

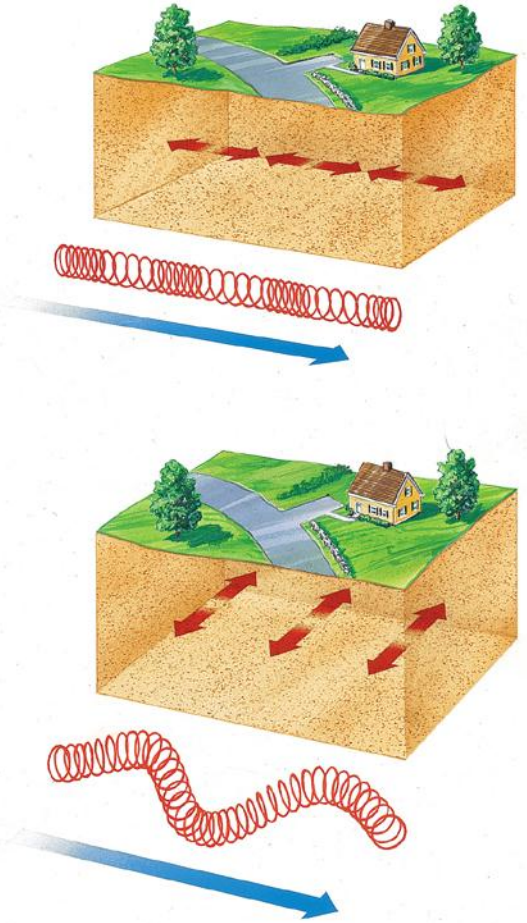
Earthquakes



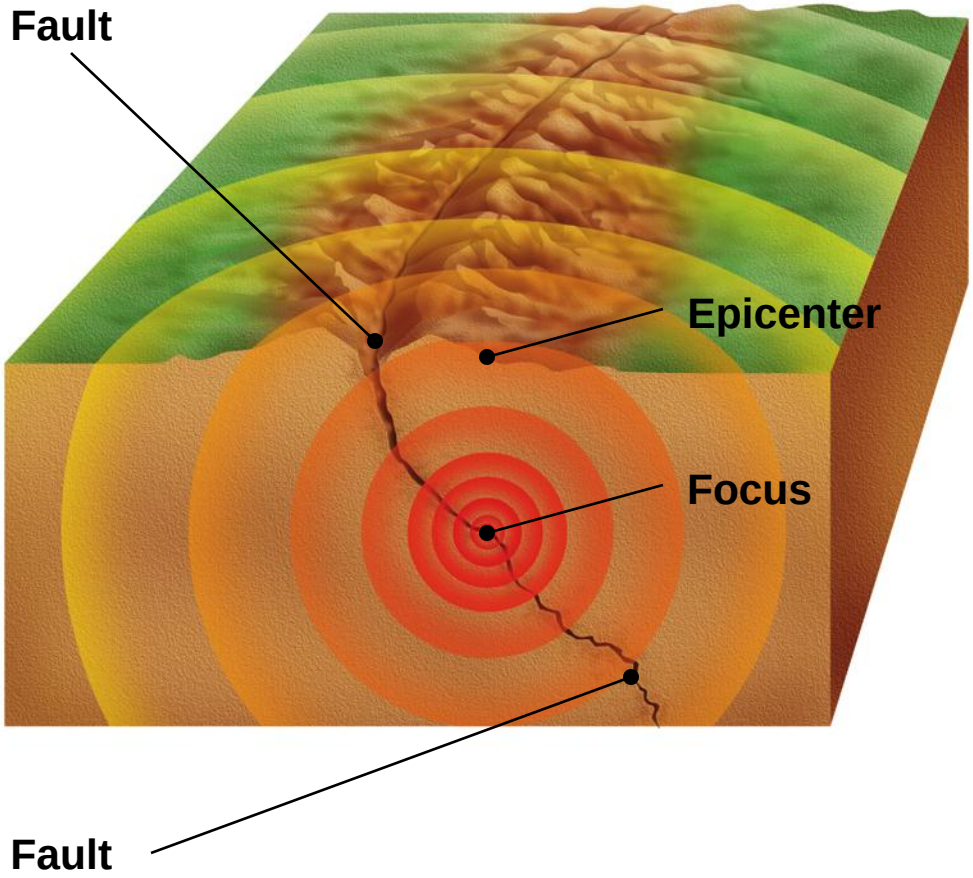


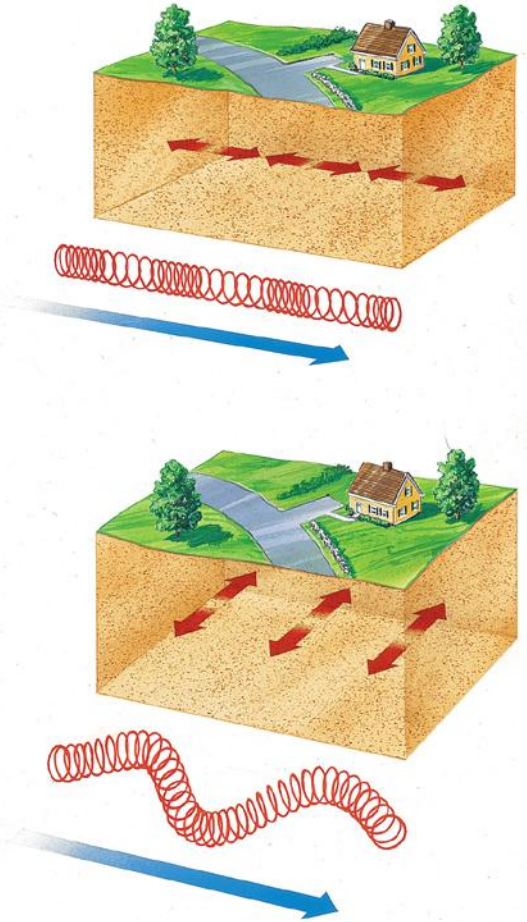
Earthquakes





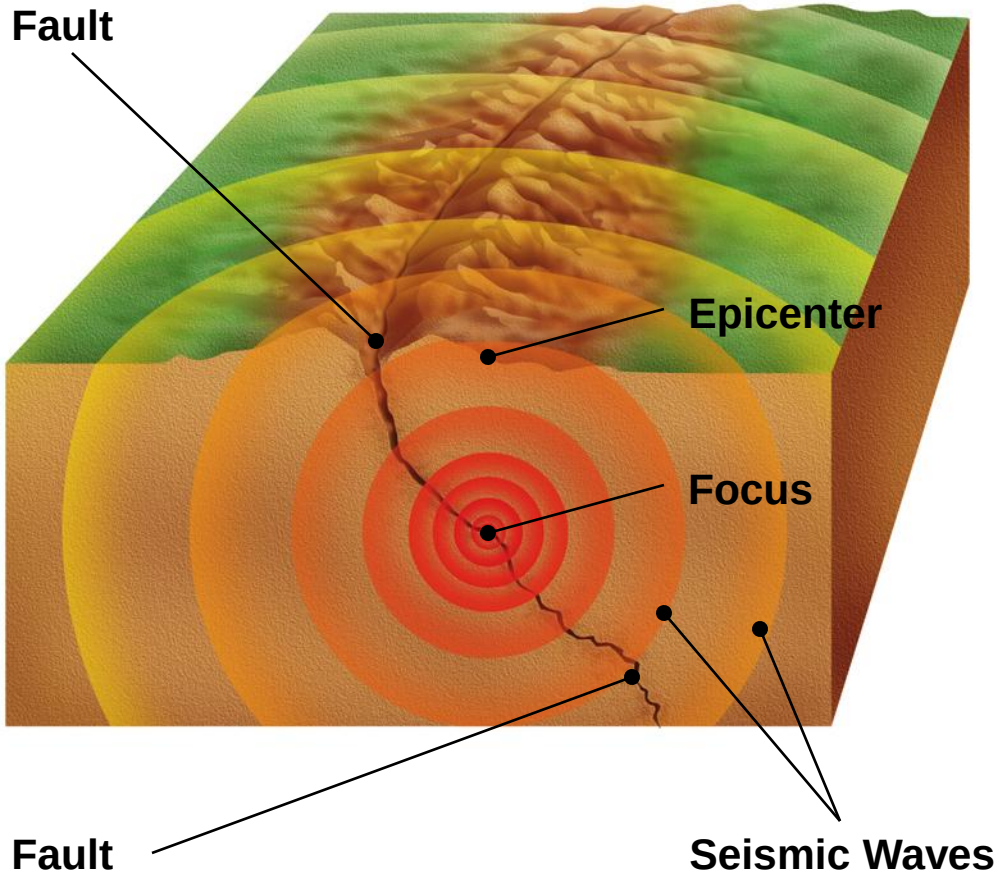
Earthquakes

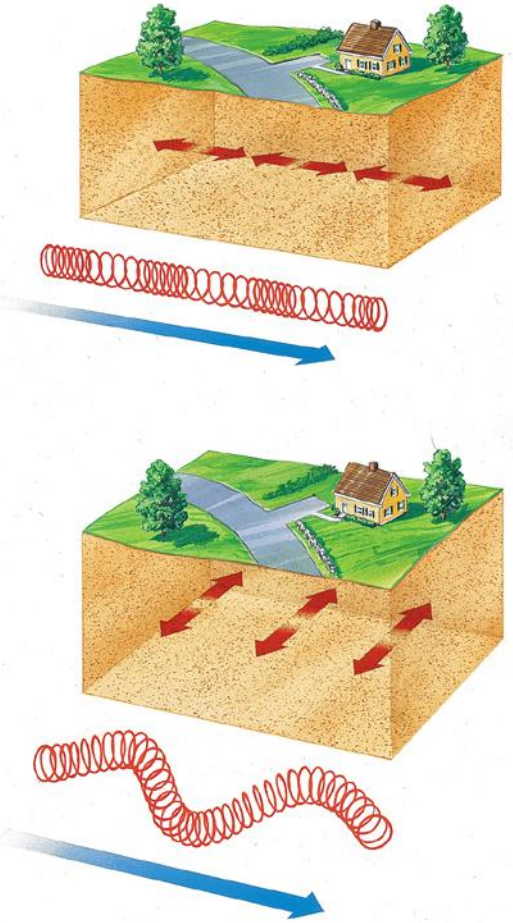




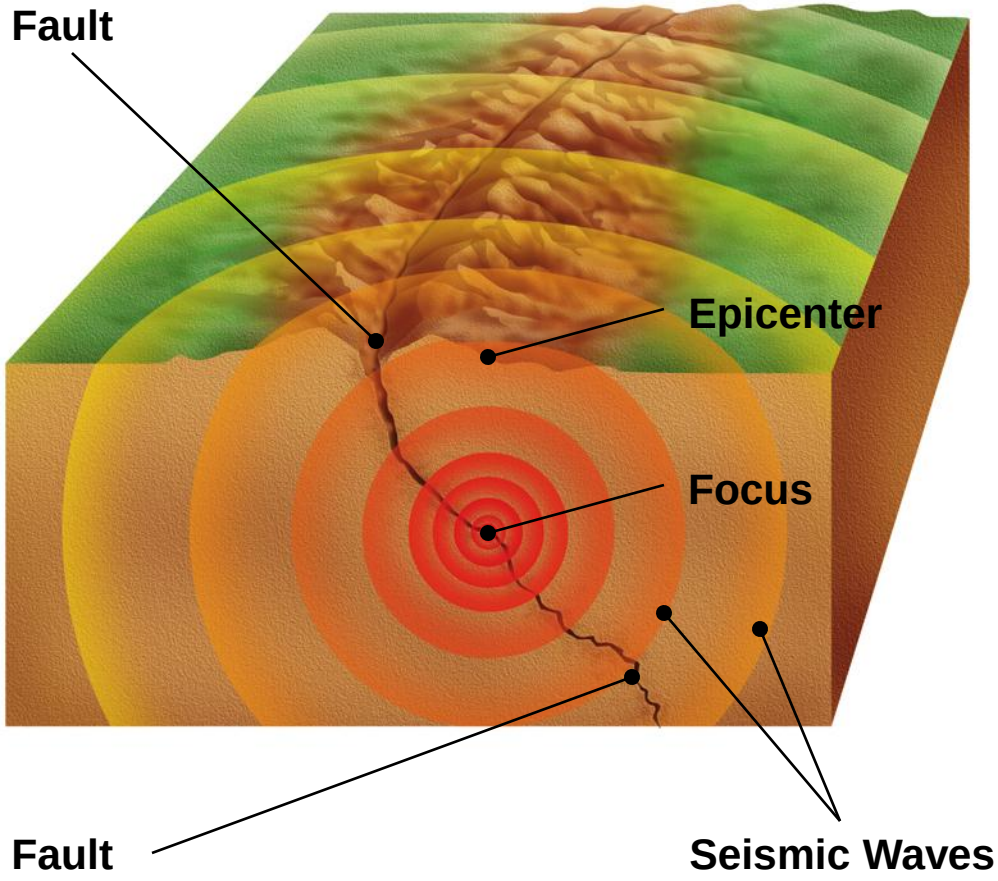
Earthquakes

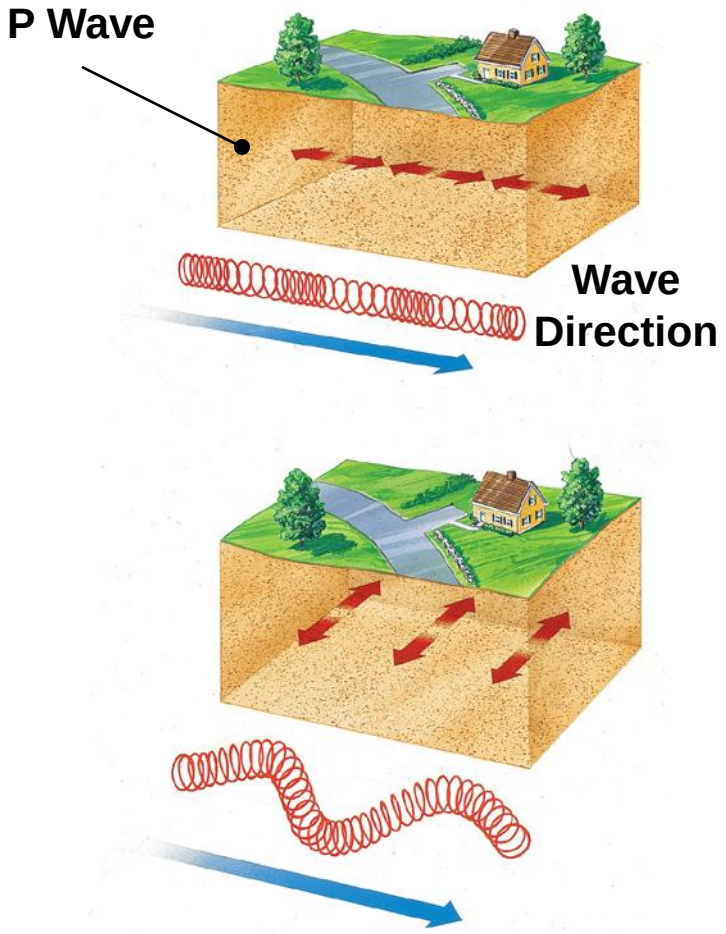
SCIENCE EXPLORER



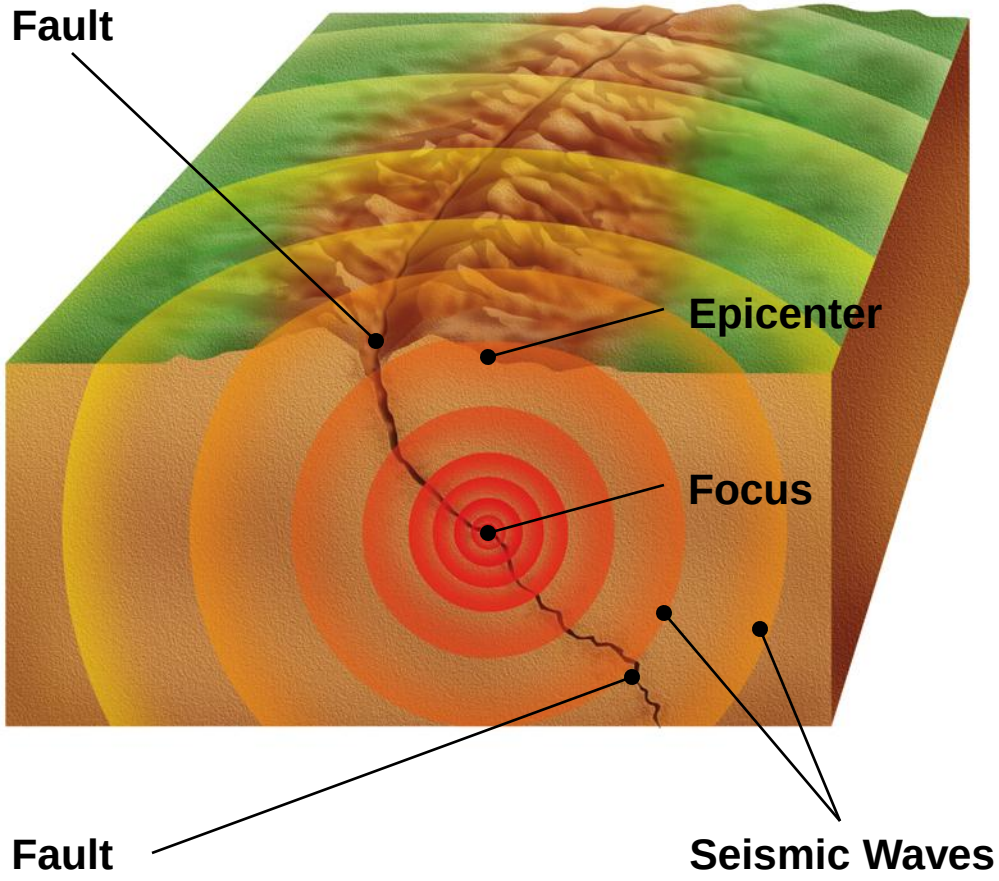


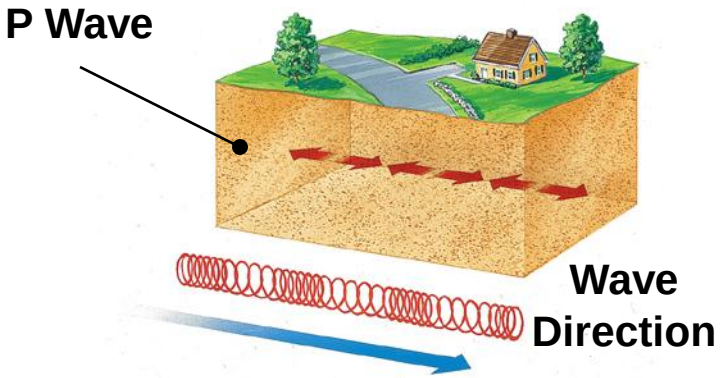
Earthquakes

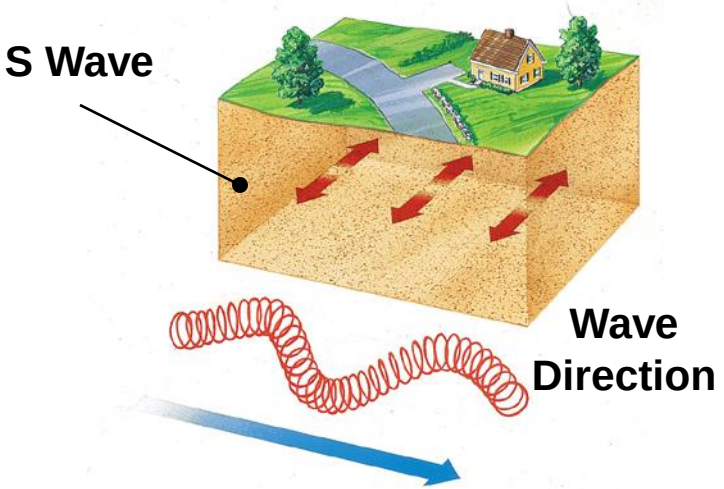




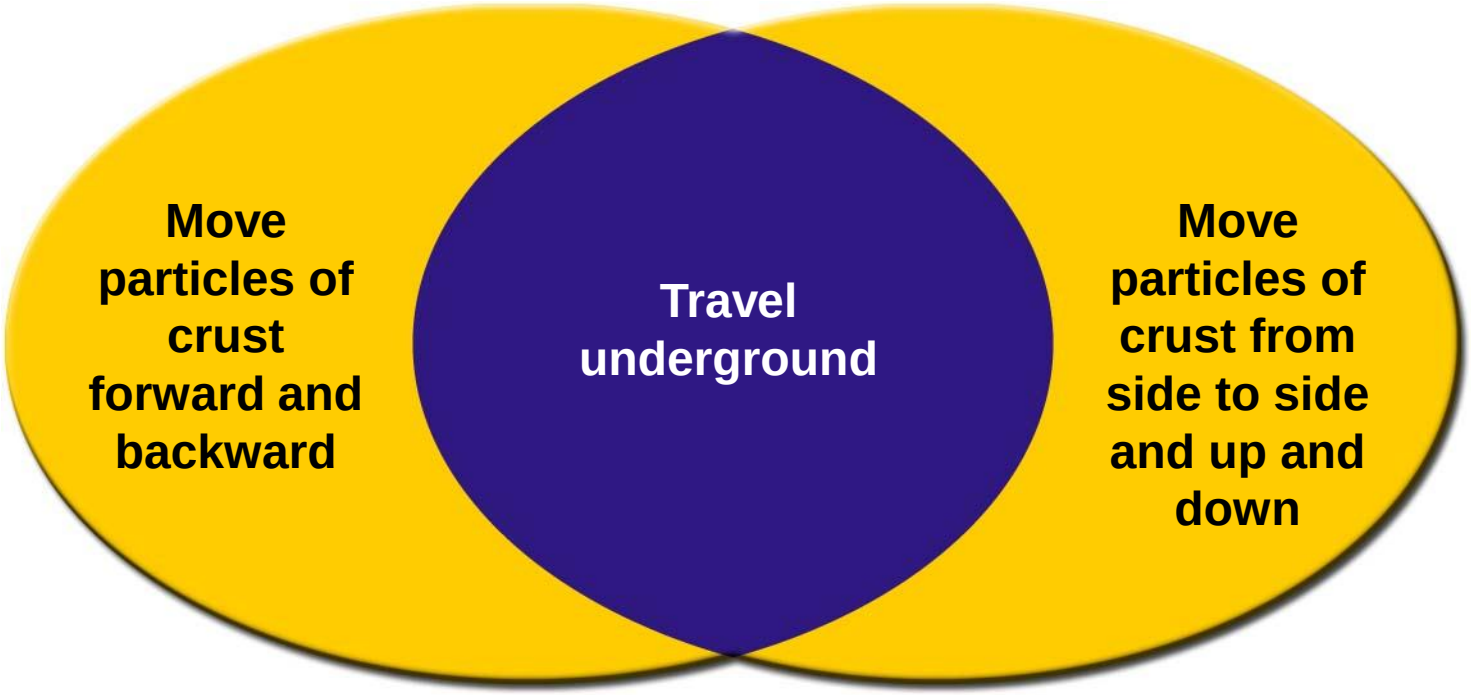
Earthquakes







Seismic Waves



Measuring Earthquakes:

- **Mercalli Scale:**
  - Not precise, the 12 steps describe how earthquakes affect people, buildings and the land surface
- **Richter Scale:**
  - Rates the size of seismic waves, works well for small nearby earthquakes, but not for large or distant earthquakes
- **Moment Magnitude Scale:**
  - Rates the total energy released by an earthquake, can be used to rate all earthquakes of all sizes, near or far

Section 12-3

Earthquake Hazards and Safety

Earthquake Safety

SCIENCE EXPLORER

The severe shaking produced by seismic waves can damage or destroy buildings and bridges, topple utility poles and fracture gas and water mains.

- **Local Soil Conditions:**
  - **A house built on solid rock will shake less than a house built on sandy soil. Loose soil shakes more than the surrounding rock.**
- **Liquefaction:**
  - **When an earthquakes violent shaking suddenly turns loose, soft soil into liquid mud.**

Earthquake Safety

- **Aftershocks:**
  - an earthquake that occurs after a larger earthquake in the same area.
- **Tsunamis:**
  - a wave caused by seismic activity

Faults

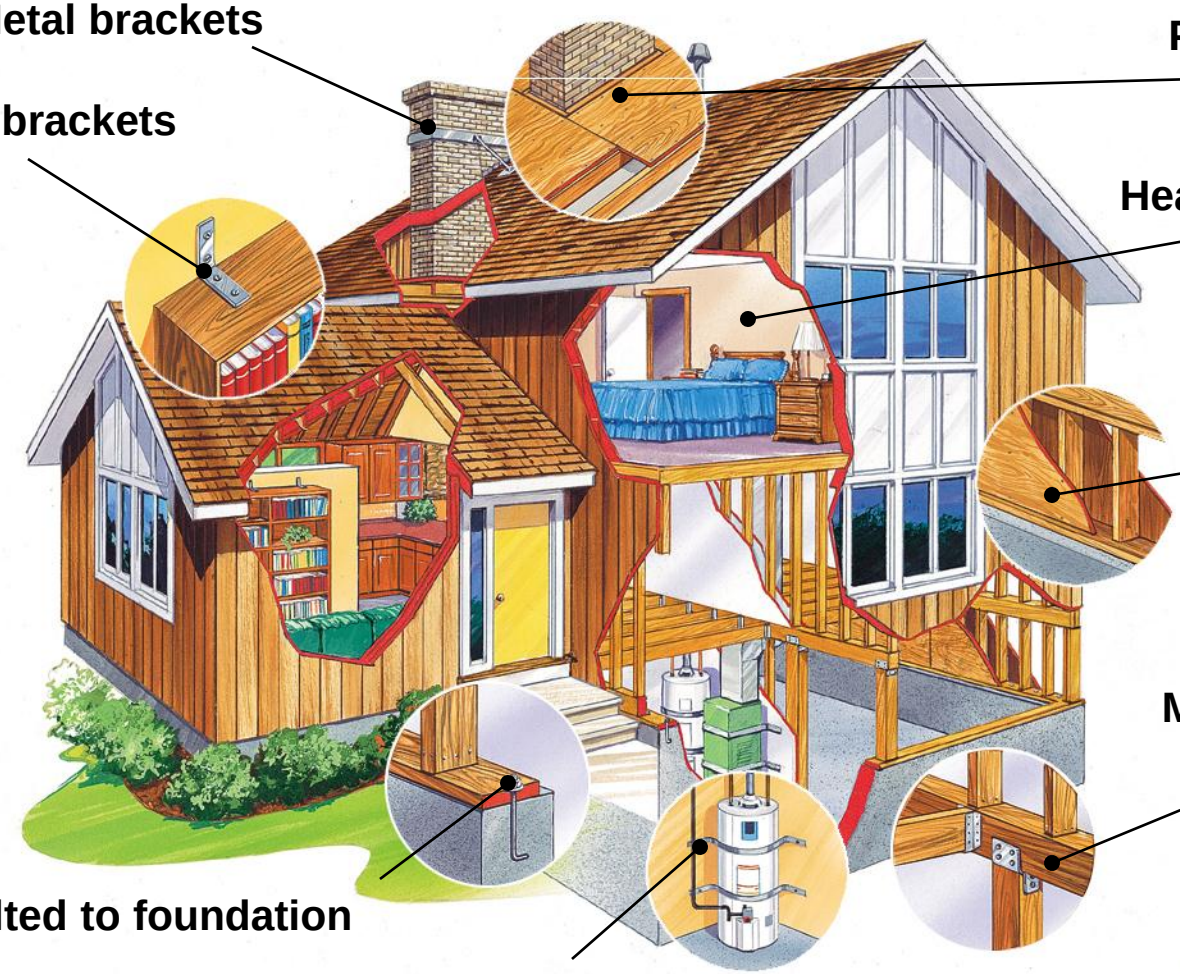
To reduce damage new buildings must be made stronger and more flexible.

- **Location, Location, Location:**
  - **people should avoid building on steep hillsides, near faults or on soft sandy soil.**
- **Construction:**
  - **reinforce wood framing, anchor buildings to the bedrock**
  - **Base-Isolated Buildings: Using shock absorbing materials as part of the base of buildings**

Earthquake Safety

SCIENCE EXPLORER

An Earthquake-proof House



Section 12-4

Monitoring Faults

Faults

Geologists use instruments that measure stress and deformation of the crust:

- **Creep Meters:**
  - Use a wire stretched across a fault to measure horizontal movement
- **Laser-Ranging Devices:**
  - Uses a laser beam to detect even tiny fault movements
- **Tiltmeters:**
  - Uses a “level” to measure ground tilting
- **Satellite Monitors:**
  - Using satellites to image faults and detect elevation changes