Volcanoes and Plate Tectonics

- **Volcano** - a weak spot in the crust where molten material, or magma, comes to the surface.
- **Ring of Fire** - Major Volcanic Belt surrounding the Pacific Ocean Tectonic Plate Boundaries

Volcano Formation
1. Along Tectonic Plate Boundaries
2. Above a hot spot when magma erupts through the crust and reaches the surface.

Hawaiian Islands – formed over “Hot Spots”
Volcanic Eruptions

**Volcano Anatomy**: 
- **Magma**: a mixture of molten rock, gases, and water not yet reaching the Earth’s surface.
- **Lava**: molten rock that has reached the Earth’s surface.
- **Magma Chamber**: magma collected inside a volcano pocket.
- **Pipe**: a long tube that connects the magma chamber to Earth’s surface.
- **Vent**: an opening through which the magma leaves the volcano.
- **Crater**: a bowl-shaped area around a volcano’s central vent.
- **Pyroclastic Flow**: an explosive fast-moving current of hot gas and rock (1800°F) hurls out ash, cinders, and bombs.
Volcanic Eruptions

As magma rises toward the surface, the dissolved gas begins to expand as pressure decreases and this exerts an enormous upward force on the magma.

When a volcano erupts, the force of the expanding gases pushes magma from the magma chamber through the pipe until it flows or explodes out of the vent.
Mt. St. Helen’s Eruption

- May 18, 1980 eruption triggered 5.1 earthquake
- 57 People killed
- 7,000 big game animals, 12 million Chinook and Coho salmon, and millions of birds and small mammals are believed to have died
- $1.1 billion in property damages for timber loss, etc.
Active, Dormant or Extinct?

- **active** volcano - is one that is erupting or has shown signs that it may erupt in the near future.
- **dormant** volcano is not active now but may become active in the future.
- **extinct** volcano is unlikely to erupt again
Four Main Types of Lava

- **Dark Colored - Pahoehoe Lava & Aa Lava**
  - a. Contains a lot of water
  - b. Rich in iron and magnesium
  - c. Cools and forms rocks like basalt
  - d. Usually thin and runny: Hawaiian

- **Light-color**
  - a. Contains only a little water
  - b. Rich in silicon and aluminum
  - c. Cools and forms rhyolite
  - d. Thick and explosive: Mt. St. Helens

- **Combination**
  - a. Chemical composition similar to both light and dark
  - b. Cools to form andesite

- **Contains > Gases**
  - a. Steam and CO2
  - b. Forms rocks w/ many holes when cooled
  - c. Pumice and scoria
Volcanic Particles

1. **Volcanic Dust**
   - a. < .25 mm
   - b. Consistency of flour grains

2. **Volcanic Ash**
   - a. .25mm – 5mm in size
   - b. Rice grain in size

3. **Cinders**
   - a. small volcanic bombs about golf ball size

4. **Volcanic bombs**
   - a. A few centimeters to
   - several meters in diameter
**Pyroclastic Flow**

- **Pyroclastic Flow** - an explosive fast-moving current of hot gas and rock (1800 °F) hurls out ash, cinders, and bombs.
Mt. Vesuvius & Pompeii, Italy

- Erupted in 79 AD, approximately 20,000 people were killed in this eruption.
- Pompeii is buried & is covered in a pyroclastic flow of cinders, ash, and mud around 20 feet high.
3 Types of Volcanoes

- **Shield Volcanoes** – Made mainly of lava sheets layers
- **Cinder Cone** – Mainly of Volcanic Cinders, ash, dust & bombs
- **Composite Volcanoes** – a combination of lava layers, cinders & ash, more lava layers, etc.
**Shield Volcanoes**

- Composed mainly of runny lava flows
- Largest volcanoes in the world
- An example: Hawaiian Islands
- Gentle slopes & domed shaped

![Diagram of a shield volcano with labeled parts: Basaltic lava, Flank Eruption, Eruption Plume, Magma Chamber]
Cinder Cone

- Made mostly of cinders and other rock particle
- Little or no lava flows
- Formed from explosive type volcanoes
- Narrow base and steep sides

[Images of Cinder Cone]
Composite Volcanoes

- Built up of alternating layers of cinders and lava
- Examples: Mt. Vesuvius in Italy, Mt St. Helens, Mt Shasta

![Composite Volcano Diagram](image)
Volcanic Landforms: Calderas

- Huge hole left by the collapse of a volcanic mountain
- An enormous eruption may empty a volcano's main vent and magma chamber. With nothing to support it, the top of the mountain collapses inward.
- Yellowstone in Wyoming, Crater Lake in Oregon
Volcanic Landforms: Necks & Dikes

- Volcanic Neck - magma hardens in a volcano's pipe. The softer rock around the pipe wears away, exposing the hard rock of the volcanic neck.
- A sill forms when magma squeezes between horizontal layers of rock and hardens.
Volcanic Landforms:  
Sills and Batholiths

- **Dike** – a vertical column of cooled magma that forms when magma forces itself across rock layers and hardens.

- **Batholith** - a large body of magma cools inside the crust, a mass of rock.