10.1 Volcanoes and Plate Tectonics
A volcano is any mountain formed of lava and or pyroclastic material.

There are over 800 volcanoes on Earth!!!
Origin of Magma

- Molten rock beneath Earth’s Surface
- Complex mixture made of 3 things
  1. melted mineral crystals
  2. dissolved gases
  3. water
Magma forms in the crust and upper mantle when solid rock partially melts. Formation depends on 3 things:

- Heat
- Pressure
- Water content.
Origins of Magma - HEAT

- At a depth of 100km temperature is 1400 – 1600 degrees Celsius (Asthenosphere – near melting point)

- Additional heat needed comes from 3 sources:
  1. Friction
  2. Heat from the Mantle
  3. Intrusion of Hot rock
Additional heat needed comes from 3 sources:

- Friction
  - As the Plates slide past each other, the produce friction, much like rubbing your hands back and forth together!
Additional heat needed comes from 3 sources:

- Heat from the Mantle
  - Deeper you go, the hotter it gets, so heat from the mantle adds to the magma chamber!
Origins of Magma - Pressure

- Pressure increases with depth inside Earth
- Increasing pressure raises the melting point/Decreasing pressure lowers melting point
If pressure drops enough decompression melting occurs.

As hot solid rock moves towards the surface its melting temperature is lowered, forming magma pockets.
Origins of Magma - Water Content

- Rocks melting temperature lowered due to water content
- “wet” rock deep beneath surface has lower melting point than a “dry” rock
Most volcanoes form along divergent and convergent boundaries.

Some form far from plate boundaries above “hot spots” in the crust.

There are 3 types of Volcanism:
- Divergent
- Convergent
- Intraplate
Divergent Boundary

- Plates pull apart and mantle rock rises to fill the gap
- As rock rises, decompression melting occurs and forms magma
- Magma erupts along axis of spreading center
  - Example – Mt. Kilimanjaro

![Divergent Boundary Diagram]
Convergent Boundary

- **Subduction Zone**
  - Descending plate partially melts at about 100-150 km deep due to:
    - Friction
    - Temperature, Pressure & water
**Convergent boundary**

- **Oceanic-Oceanic Plate Boundary**
  - Forms chain of volcanoes on the ocean floor
  - Eventually grow large enough to rise above ocean and form volcanic island arc
  - Ring of Fire – long belt of volcanoes that circle much of the Pacific Ocean
Convergent boundary

- **Oceanic - Continental Plate Boundary**
  - Result in continental volcanic arc
Intraplate Volcanism

- Volcanic activity that occurs within a plate
  - Kilauea volcano in Hawaii is Earth’s most active volcano
  - Yellowstone National park is a volcanic region
- Occurs where a mass of hotter than normal mantle material called mantle plume rises toward the surface
- Hot spot – small volcanic region a few hundred km across
  - More than 40 hot spots are known
  - Volcanic mountains of Hawaii have formed as the Pacific Plate moves over a hot spot.
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**Diagram:****

- **Litosfera**
- **Płyta pacyficzna**
- **Astenosfera**
- **Magma**
- **Pióropusz**