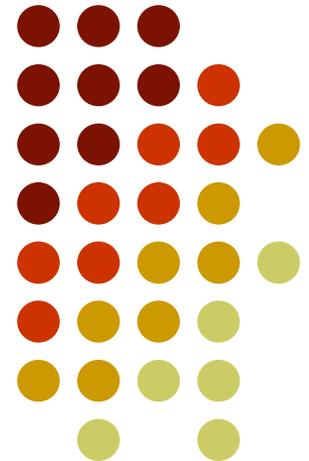


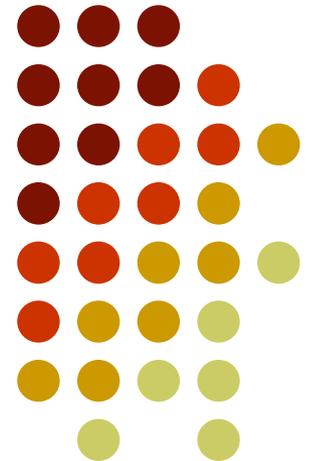
# Goal 2.1 Forces in the Lithosphere

Volcanic Activity

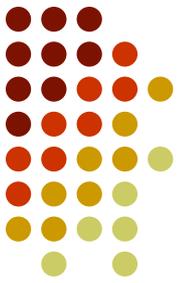


# Lesson 3

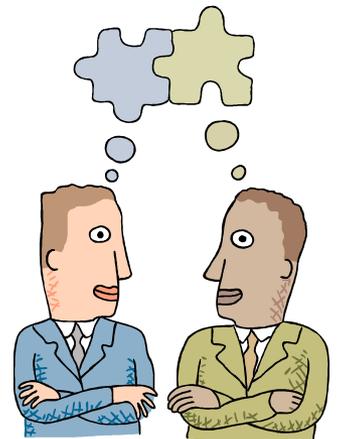
## Volcanoes, Part 1



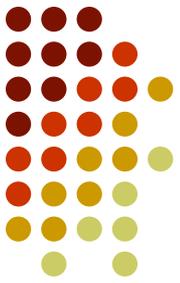
# Think About It...



What happens when you shake a can of soda and then open it?

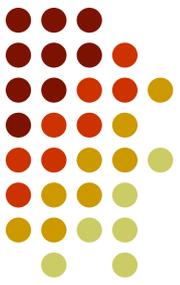


# Focus Question...



How does the composition of  
magma affect its  
explosiveness?





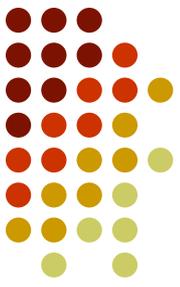
# A. Magma...

1. What is **magma**?
  - ✓ A mixture of molten rock, suspended mineral grains, and dissolved gases deep beneath Earth's surface



**Nyiragongo Volcano**

# 2. Types of Magma: Basaltic...

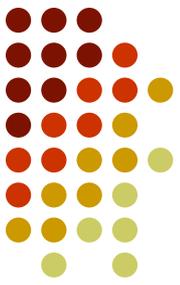


1. Gas Content
  - ✓ 1 – 2 %
2. Silica Content
  - ✓ 50%
3. Viscosity
  - ✓ low
4. Explosiveness
  - ✓ least
5. Origin/Location of Magma/Lava
  - ✓ oceanic/continental crust
6. Example
  - ✓ Mt. Kilauea in Hawaii



**Mt. Kilauea**

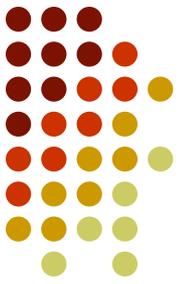
# Types of Magma: Andesitic...



1. Gas Content
  - ✓ 3 - 4 %
2. Silica Content
  - ✓ 60%
3. Viscosity
  - ✓ intermediate
4. Explosiveness
  - ✓ intermediate
5. Origin/Location of Magma/Lava
  - ✓ continental margins
6. Example
  - ✓ Mt. St. Helens in Washington state



# Types of Magma: Rhyolitic...

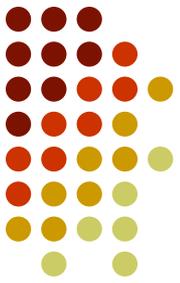


1. Gas Content
  - ✓ 4 - 6 %
2. Silica Content
  - ✓ 70%
3. Viscosity
  - ✓ high
4. Explosiveness
  - ✓ greatest
5. Origin or Location of Magma/Lava
  - ✓ continental crust
6. Example
  - ✓ Yellowstone Supervolcano in Wyoming

**Yellowstone Volcano**

# Types of Magma...

3. The higher the silica content...
  - ✓ the higher the viscosity (resistance to flowing)...
  - ✓ the greater the explosiveness!

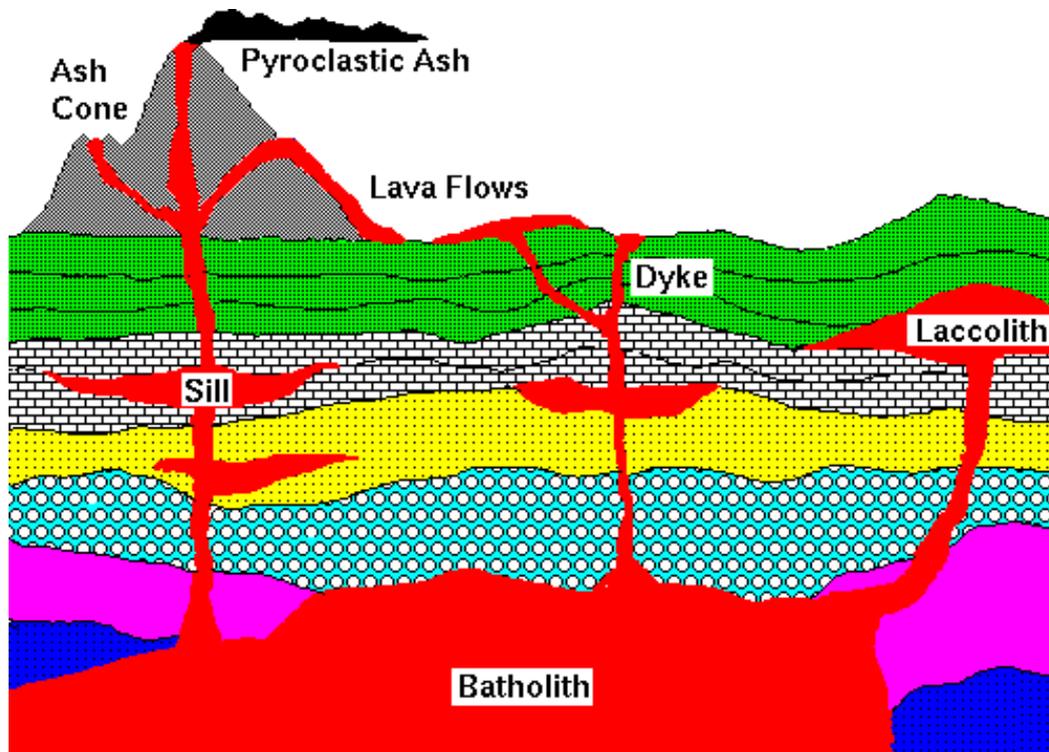


**Krakatoa**

## B. Intrusive Activity...

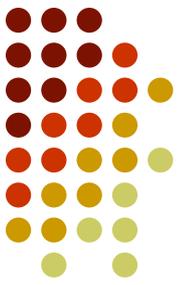
### 1. What is a **pluton**?

- ✓ An intrusive igneous rock body

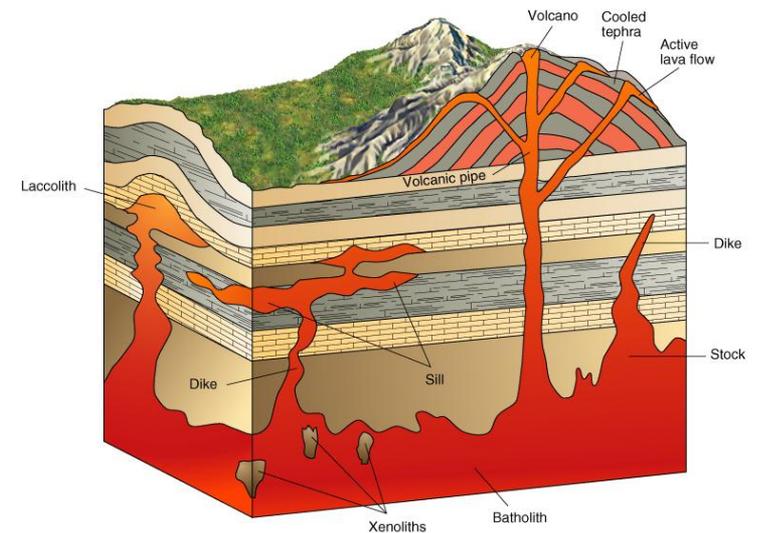


**Pluto –  
god of the  
underworld**

# A Plethora of Plutons... Batholiths

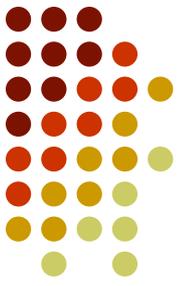


2. A **batholith** is the largest of plutons common in the interiors of major mountain chains.

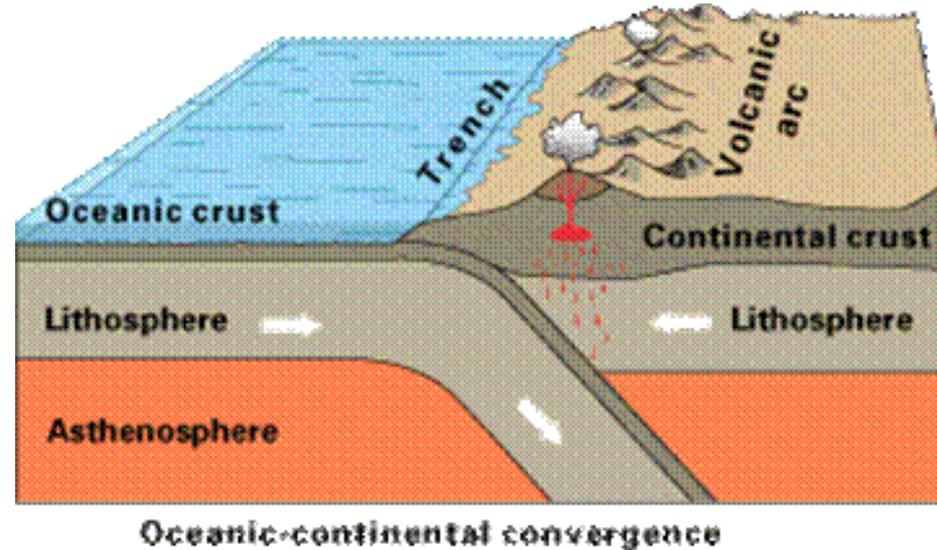


**Yosemite – Part of the Sierra Nevada Batholith**

# Intrusive Activity...



3. Where did all the magma come from?
- Scientists hypothesize that...
    - At subduction zones, a plate is pulled down into the mantle...
    - where it melts...
    - then cools into a pluton.



## C. Volcanoes...

### 1. What is **lava**?

- ✓ molten rock that has reached Earth's surface

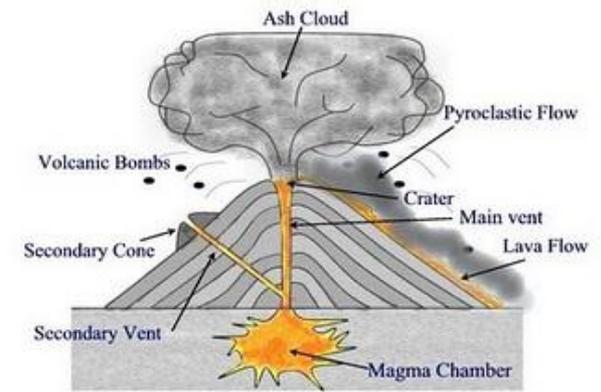
### 2. What is a **volcano**?

- ✓ A mountain or opening in Earth's crust from which lava erupts



**Paricutin in Mexico, 1943**

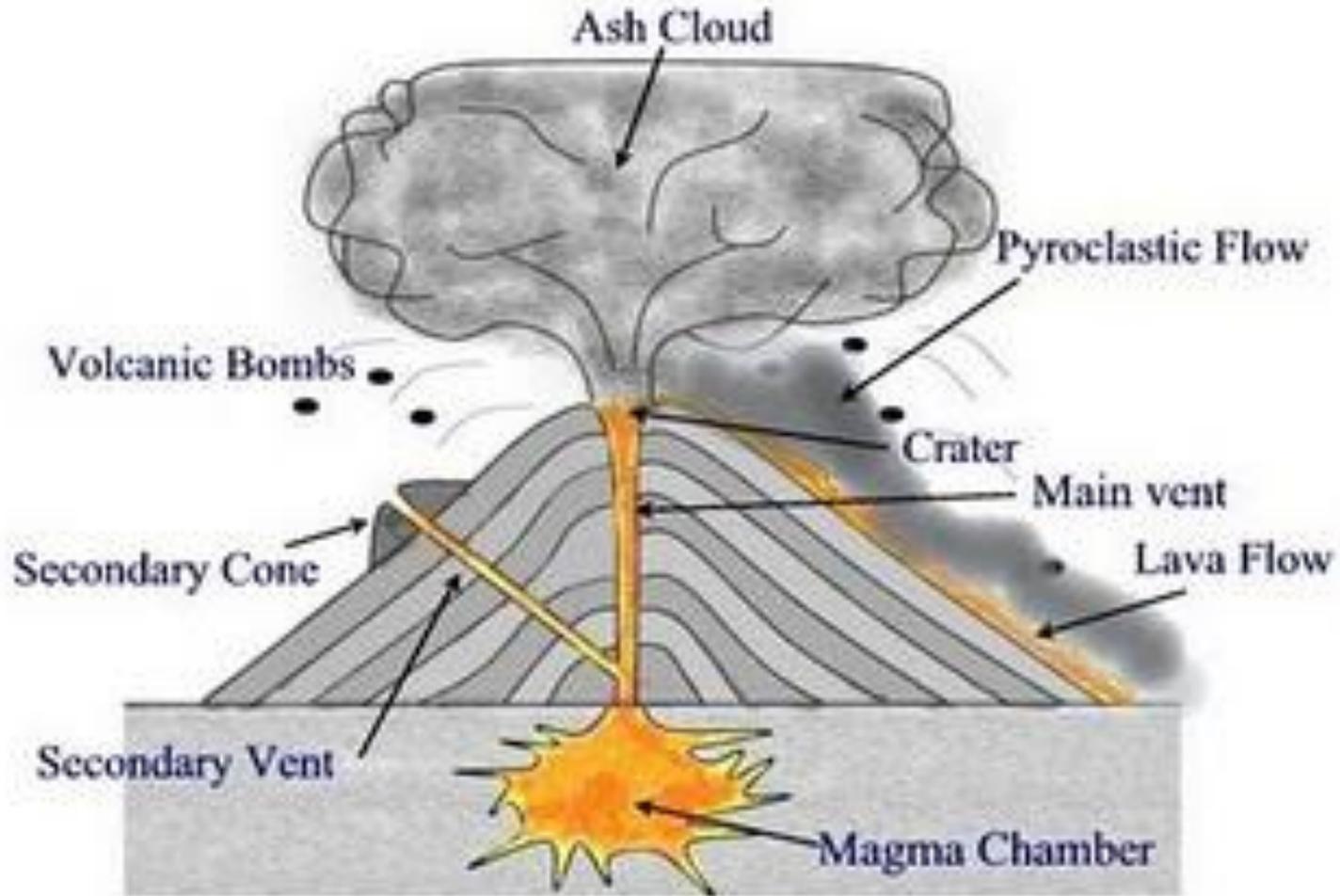
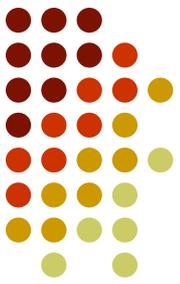
# 3. The Anatomy of a Volcano...



Main Features of a Volcano

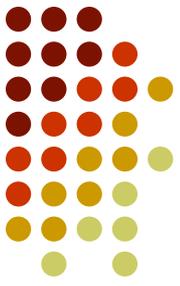
- a. **Vent** – the opening in the crust through which lava erupts
- b. **Crater** – bowl-shaped depression around the vent
- c. **Caldera** – larger depressions around a vent where the volcano has collapsed into the magma chamber
- d. **Magma chamber** – area under the volcano which holds the magma

# 4. Label the Volcano...



**Main Features of a Volcano**

# D. Types of Volcanoes...



- Type of Volcano
  - Shield
- How It Forms
  - Basaltic lava accumulates
- Description
  - Broad with gently sloping sides
- Example
  - Kilauea in Hawaii



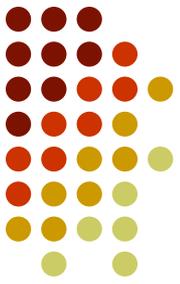
# Types of Volcanoes...

- Type of Volcano
  - Cinder cone
- How It Forms
  - Ejected tephra falls back to earth and piles up
- Description
  - Small but steep-sided
- Example
  - Paricutin in Mexico
  - Izalco in Central America



**Paricutin, Mexico**

# Types of Volcanoes...

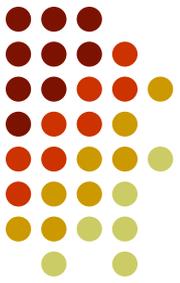


- Type of Volcano
  - Composite
- How It Forms
  - Tephra eruptions alternate with lava flows
- Description
  - Large and steep
- Example
  - Mt. St. Helens



**Mt. St. Helens -  
Before and After!**

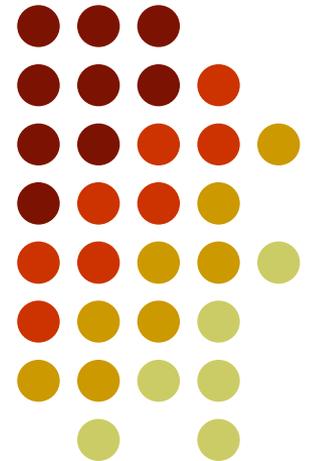
# A Composite Volcano...



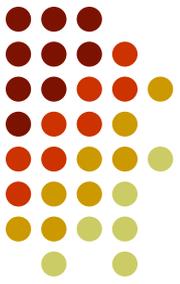
- <http://www.pbs.org/wgbh/nova/volcanocity/anat-flash.html>

# Lesson 4

## Volcanoes, Part 2



# Tephra...



## 1. What is tephra?

- Rock fragments thrown into the air during a volcanic eruption

## 2. Tephra classified by size...

- dust → ash → lapilli → bombs → blocks

## 3. A pyroclastic flow is...

- an eruption of gas, ash, and other tephra
- These types of eruptions can be extremely violent and deadly because the PC flow moves very fast and is very hot.

- ## 4. Ash and dust from a pyroclastic flow blocks sunlight and lowers global temperatures.

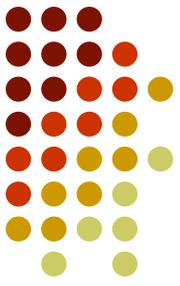
# Effects of a Volcanic Eruption... Lahars



- A lahar is a mixture of mud and debris created when heat from a volcanic eruption melts snow.
- A mudflow can also be created from the rain often caused by volcanic dust/ash in the atmosphere.

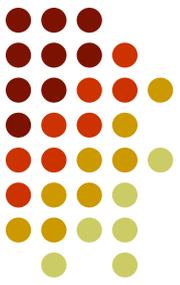


# Earthquakes, Landslides and Tsunamis...



2. Earthquakes are caused when...
  1. Magma making its way to the surface breaks the rocks that it is moving through.
3. Landslides are caused in two ways...
  1. ... a volcanic earthquake causes land to slide
  2. ... the eruption itself causes the sides of the volcano to slide off!
4. Tsunamis are caused when...
  1. ... the volcanic landslide “bulldozes” water ahead of it

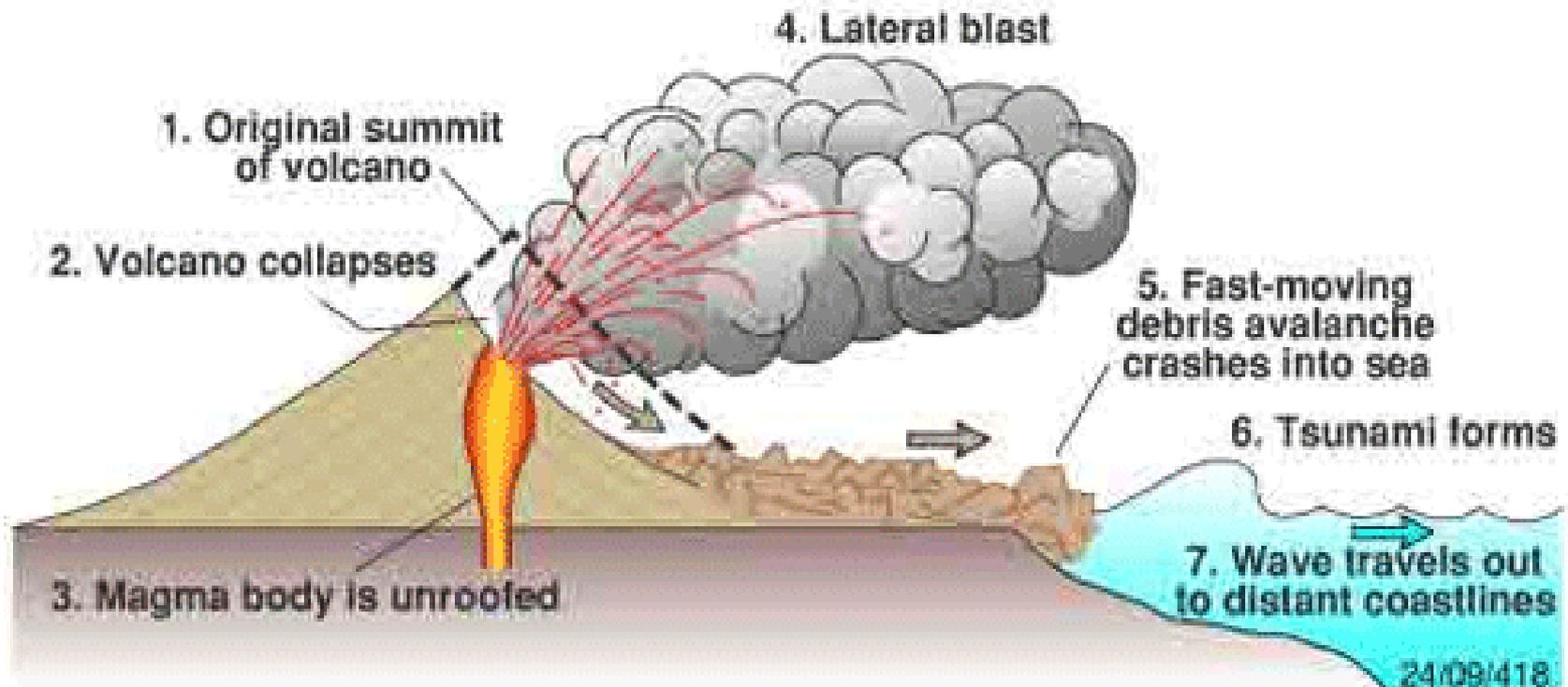
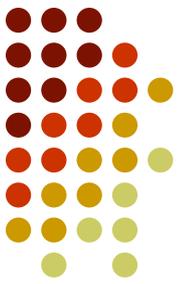
# Earthquakes, Landslides and Tsunamis...



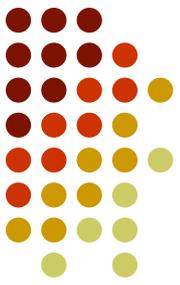
<http://volcanoes.usgs.gov/hazards/landslide/index.php>

[http://volcanoes.usgs.gov/Images/Jpg/Unzen/MayuyamaSlide\\_large.jpg](http://volcanoes.usgs.gov/Images/Jpg/Unzen/MayuyamaSlide_large.jpg)

# Earthquakes, Landslides and Tsunamis...



# 5. Kilauea: Effects on Land...

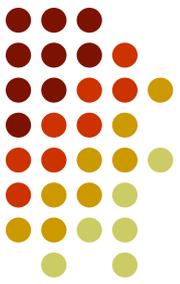


Basaltic lava...

- ✓ burns vegetation and buildings
- ✓ creates new land



# 6. Krakatoa: Effects on Land...

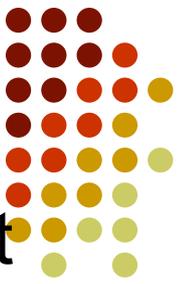


The eruption of Krakatoa...

- ✓ Created a caldera when it blew the island apart
- ✓ Caused a pyroclastic flow and tsunami (1883)



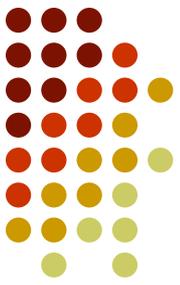
# 7. Iceland: Effects on Land...



Iceland's volcanoes in the rift valley are causing it to grow bigger – with older rocks on the east and west sides of the island.



# Where Do Volcanoes Occur?



## a. Convergent boundaries –

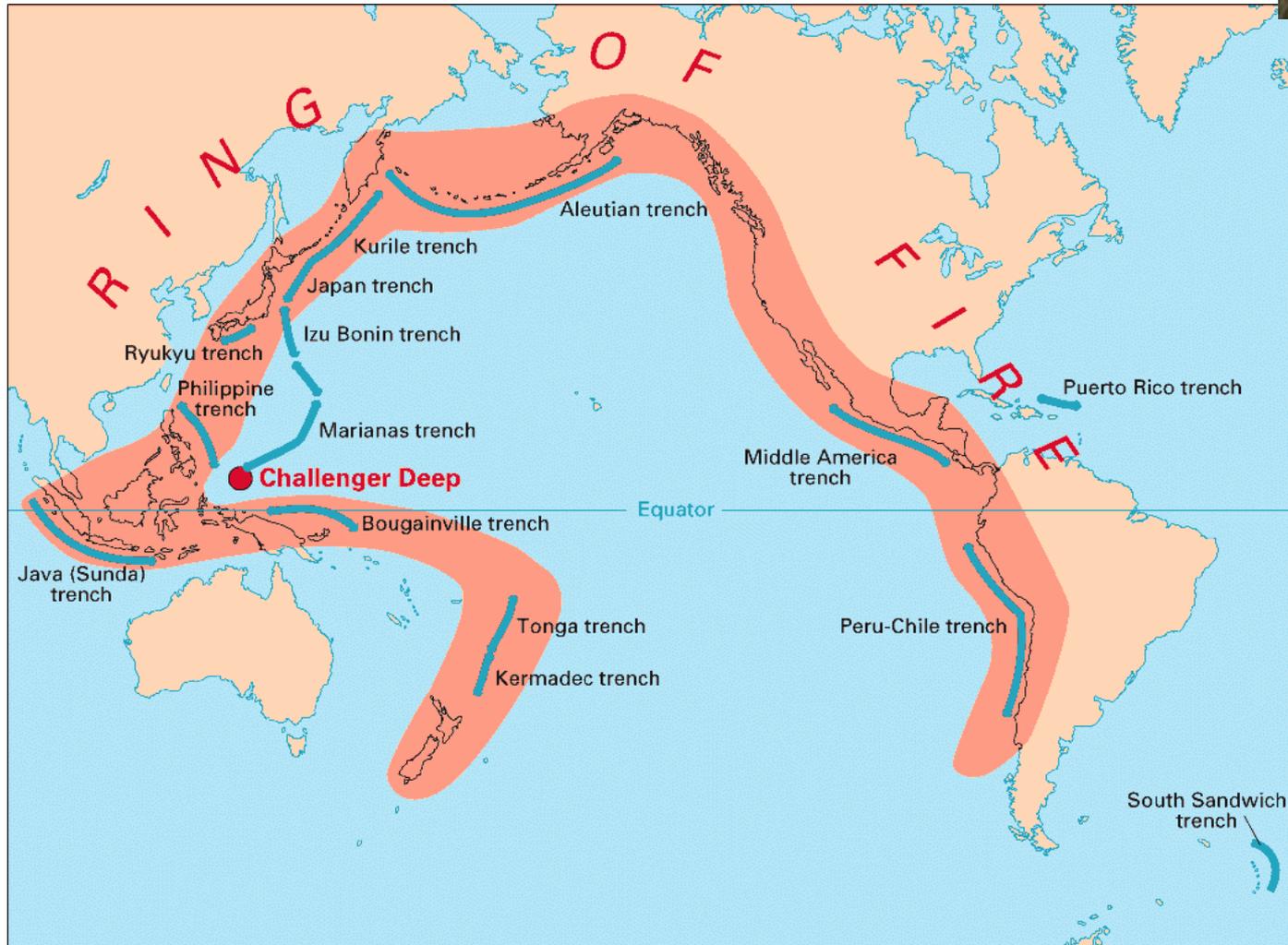
- Ocean plates subduct under other plates and melt to form magma
- Location – the Pacific Ring of Fire, the Mediterranean Belt



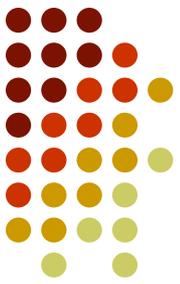
**Mt. Vesuvius and  
Pompeii Victims**



# The Ring of Fire...



# Where Do Volcanoes Occur?

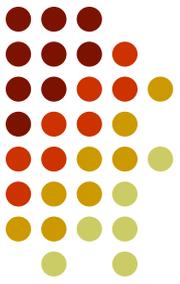


## b. Divergent boundaries –

- As plates move apart, magma is forced upward into fractures and faults
- Location – East Africa Rift Valley, mid-ocean ridges, Iceland



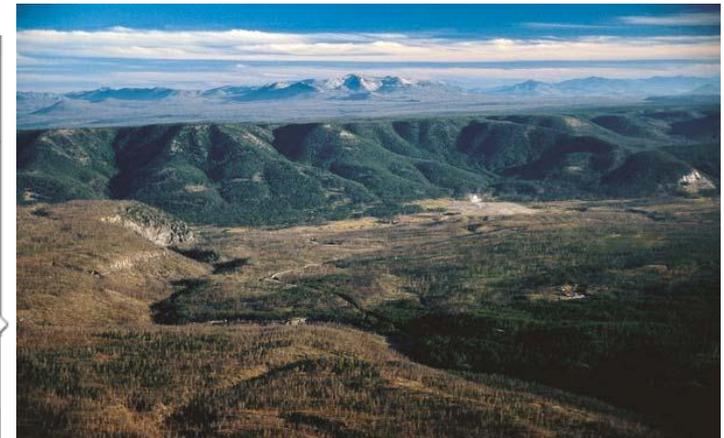
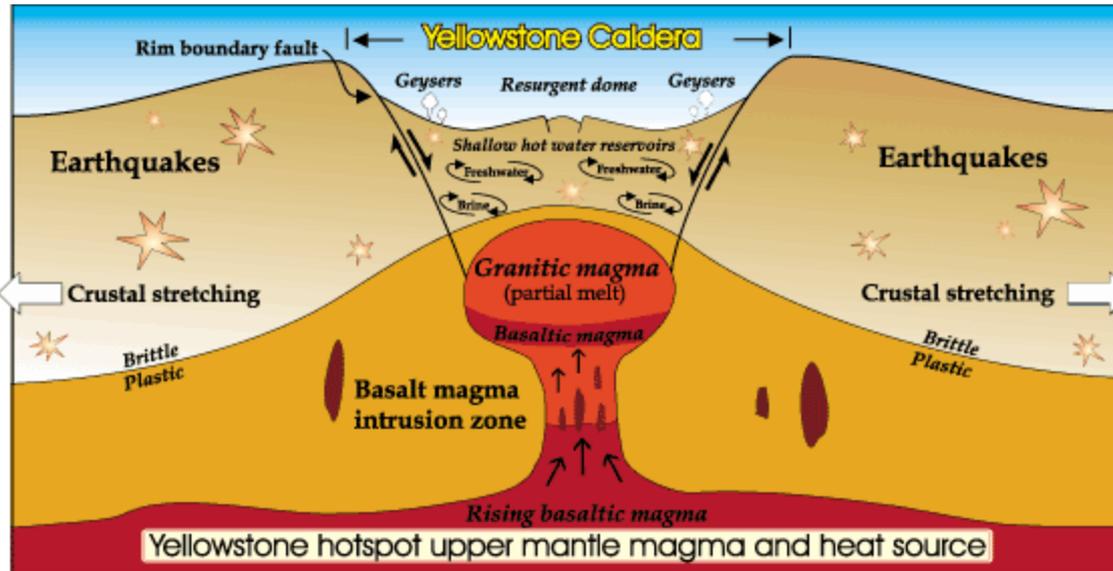




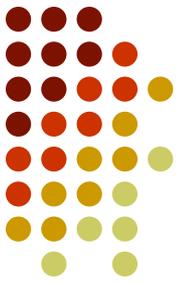
# Where Do Volcanoes Occur?

## b. Hot Spots –

- Magma rises from unusually hot regions of Earth's mantle in the center of a plate
- Location – **Hawaii, Yellowstone**

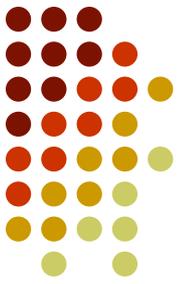


# Pluton Slides...

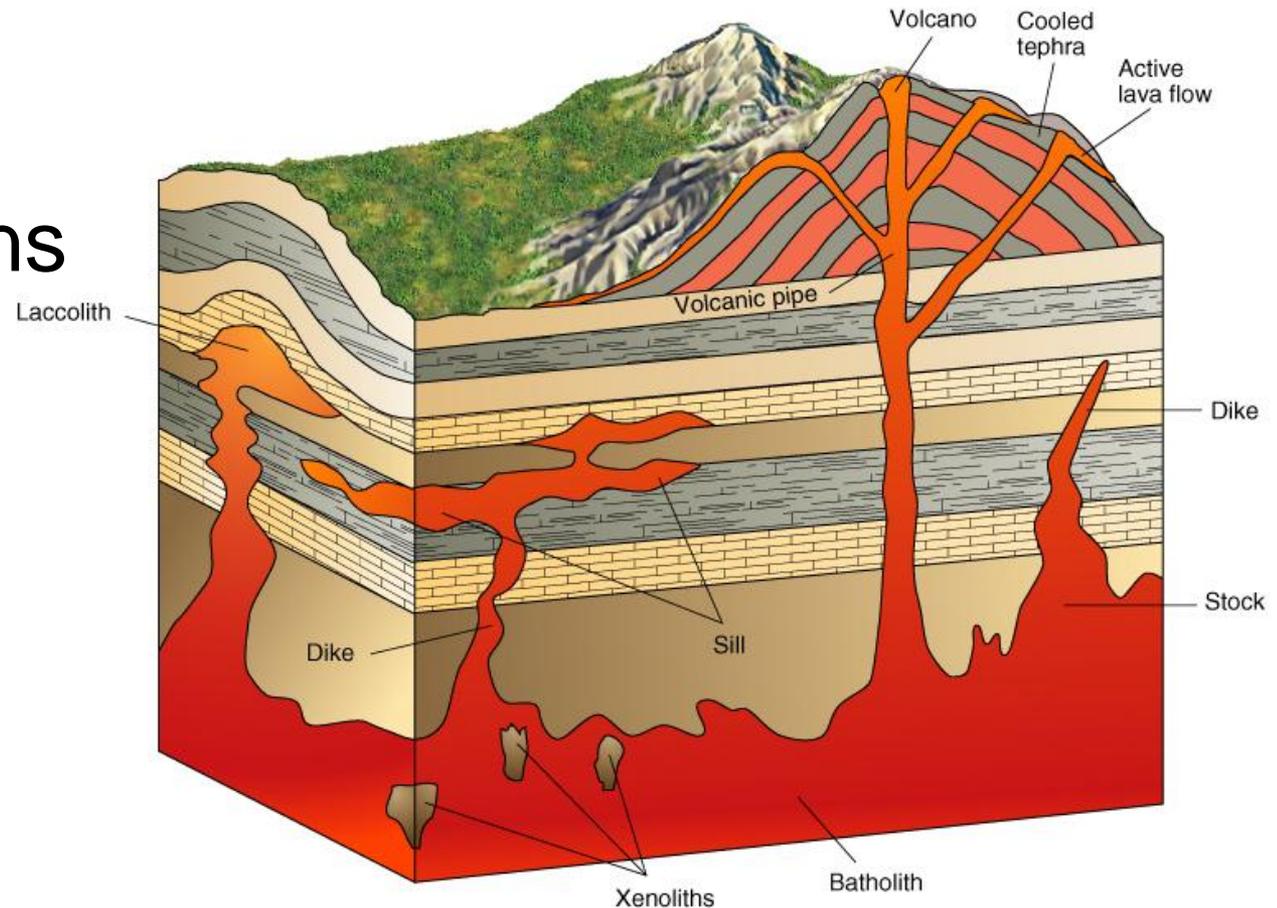


- The following slides depict different types of plutons. I cut these slides from the notes but left the slides on the ppt for future reference!

# A Plethora of Plutons... Stocks

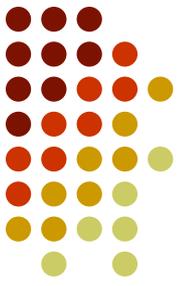


- **Stocks** are irregularly-shaped plutons similar to batholiths but smaller.

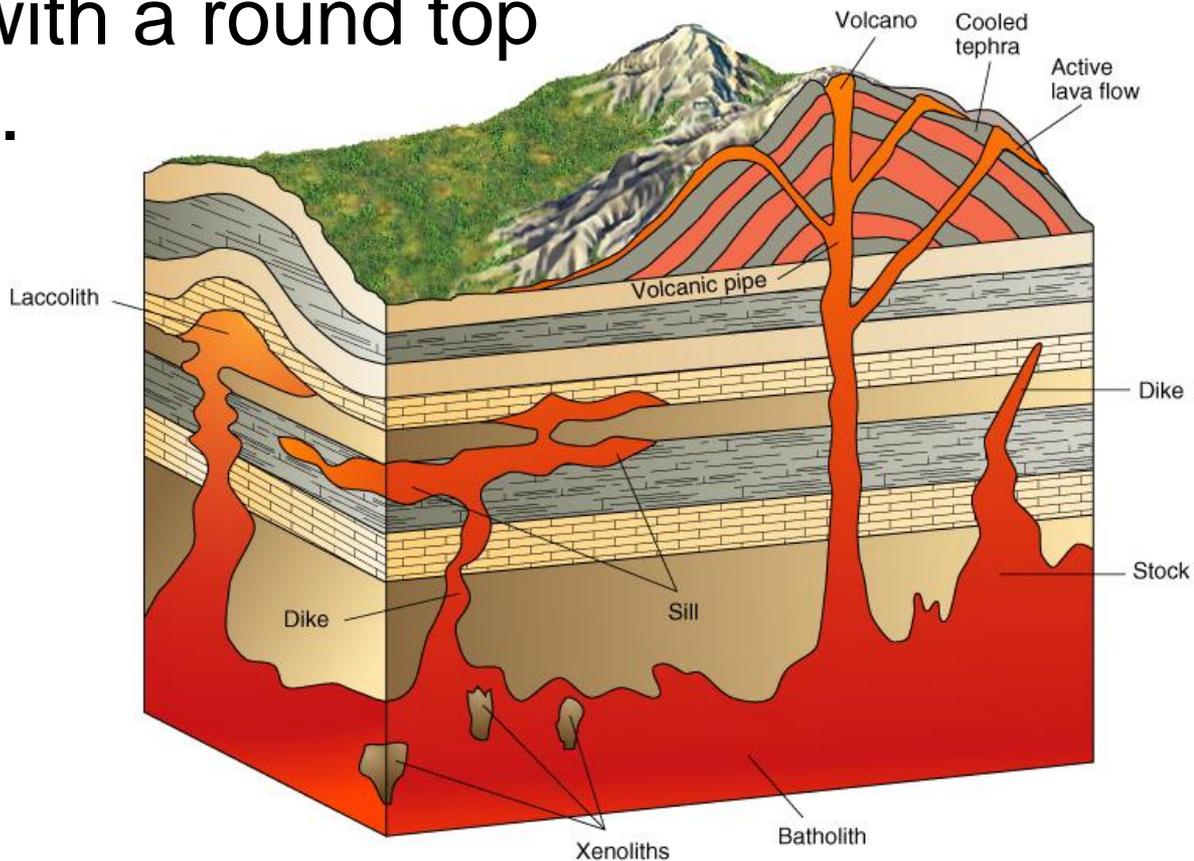


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# A Plethora of Plutons... Laccoliths



- **Laccoliths** are mushroom-shaped plutons with a round top and a flat bottom.

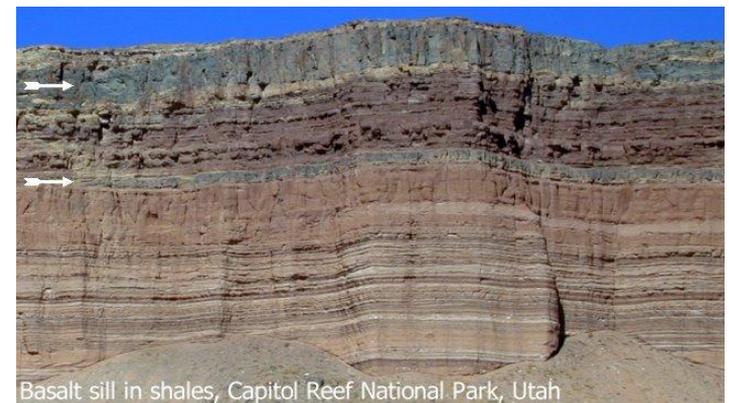
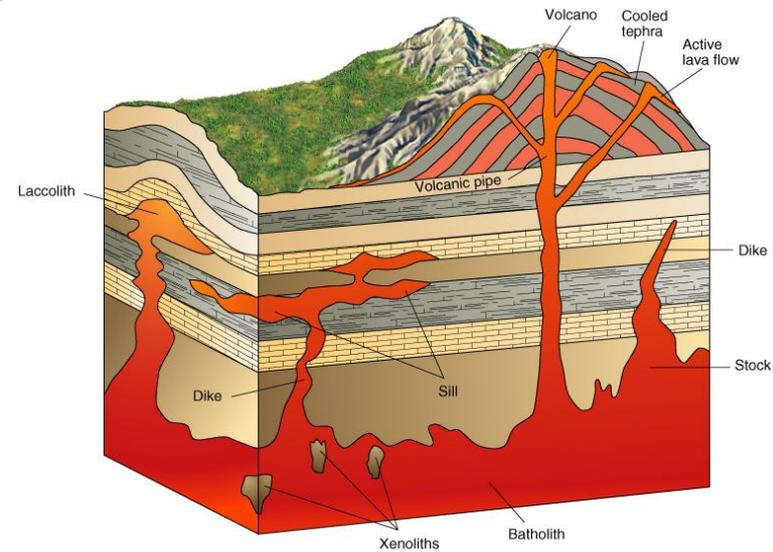
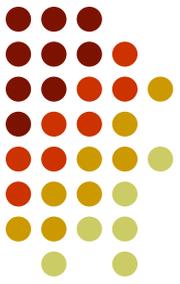




The lighter colored rock in the background is the granite of the Cuernos del Paine laccolith. Twelve million years ago this granite was intruded into shales and sandstones. The heat from the granite magma has altered the sedimentary rocks into a metamorphic rock called hornfels (the dark rocks which cap the laccolith). Located in Torres del Paine National Park, Chile.

# A Plethora of Plutons... Sills

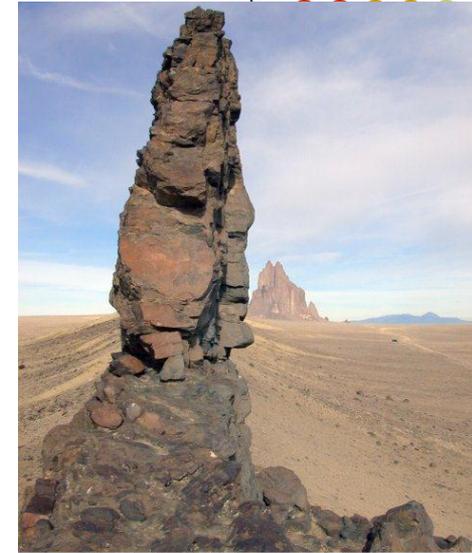
- A **sill** is a pluton that forms when magma intrudes parallel to layers of rock.



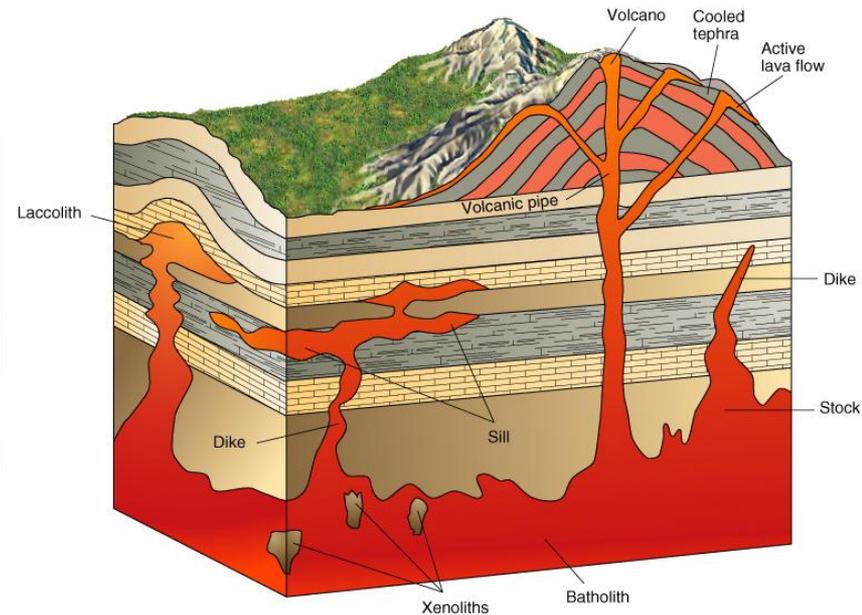
# A Plethora of Plutons... Dikes



- A **dike** is a pluton that cuts across preexisting rocks.



Radial dike at Shiprock, New Mexico



# Dike formation in Laramie Range, Wyoming...basaltic dikes

