

Igneous and Volcanic Rocks and processes

Magma and Lava

Igneous Rocks

Plutons

Volcanism and Volcanoes

Plate Tectonics, Volcanoes, and Plutons

Part 2. Volcanic Rocks



*An example of topographic inversion near Orland, California,
The basalt now capping a ridge once flowed into a valley*

www.crack.seismo.unr.edu/ftp/pub/louie/class/plate/deformation.html
www.elements.geoscienceworld.geology.campus.ad.csulb.edu/people/bperry/IgneousRocksTour/VolcanoesAndLavaFlows.html
Lei, J. and Zhao, D., 2006, Physics of the Earth and Planetary Interiors, vol. 154, no. 1, p. 44–69
www.nature.com/nature/journal/v416/n6878/fig_tab/416310a_F1.html
ars.els-cdn.com/content/image/1-s2.0-S0031920105001780-gr24.jpg
www.2ndsemesterr.wikispaces.com/Plate+Tectonics+Vocabulary
www.aseptec-sg.com/images/sonocrystallisation.jpg
www.library.gl.ciw.edu/GLHistory/pgbowen.html
.org/content/8/4/257/F2/graphic-2.large.jpg

Volcanic Rocks, volcanism and volcanoes

- Volcanism is the eruption of magma, and associated gases at the surface.



- Some magma erupts explosively as pyroclastic (fire-broken) rock and other erupts as lava flows.



Volcanic Rocks, volcanism and volcanoes

- Volcanism is a constructive process, creating oceanic islands, oceanic crust, island arcs, and volcanic mountain chains along convergent plate margins as well as critical atmospheric gases.

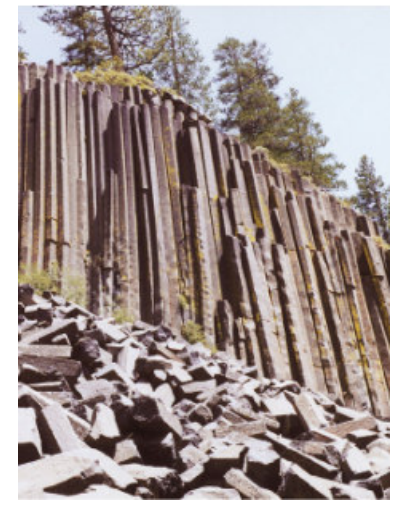


Volcanic Rocks, volcanism and volcanoes

- Volcanoes are conical masses of erupted lava flows and pyroclastic rock that form around vents.

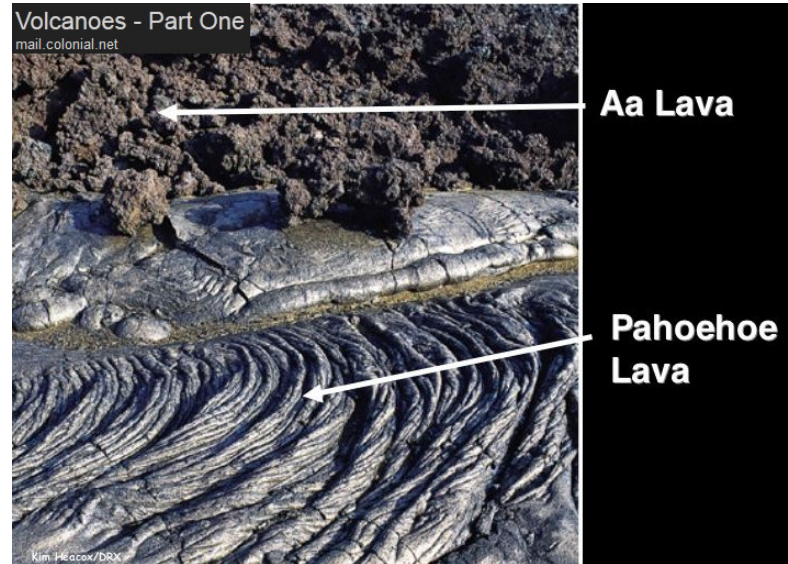
- Columnar, often hexagonal, jointing may form when lavas cool.

- Pillow lavas are bulbous, interconnecting masses that result from underwater eruption of basaltic lavas.



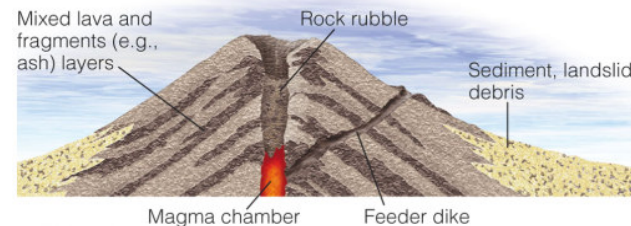
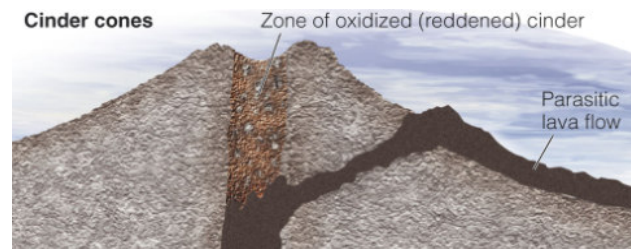
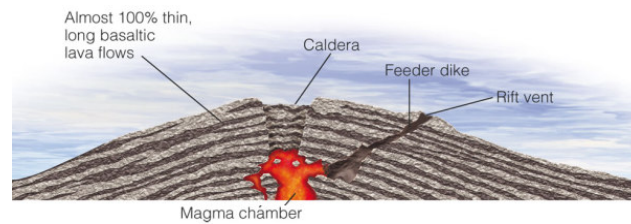
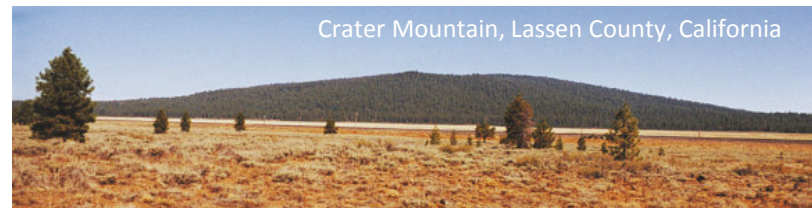
Volcanic Rocks, volcanism and volcanoes

- Two types of lava flows are *pahoehoe* (rubbly – high viscosity) and *aa* (ropy - low viscosity).
- Lava tubes
- Pyroclastic material

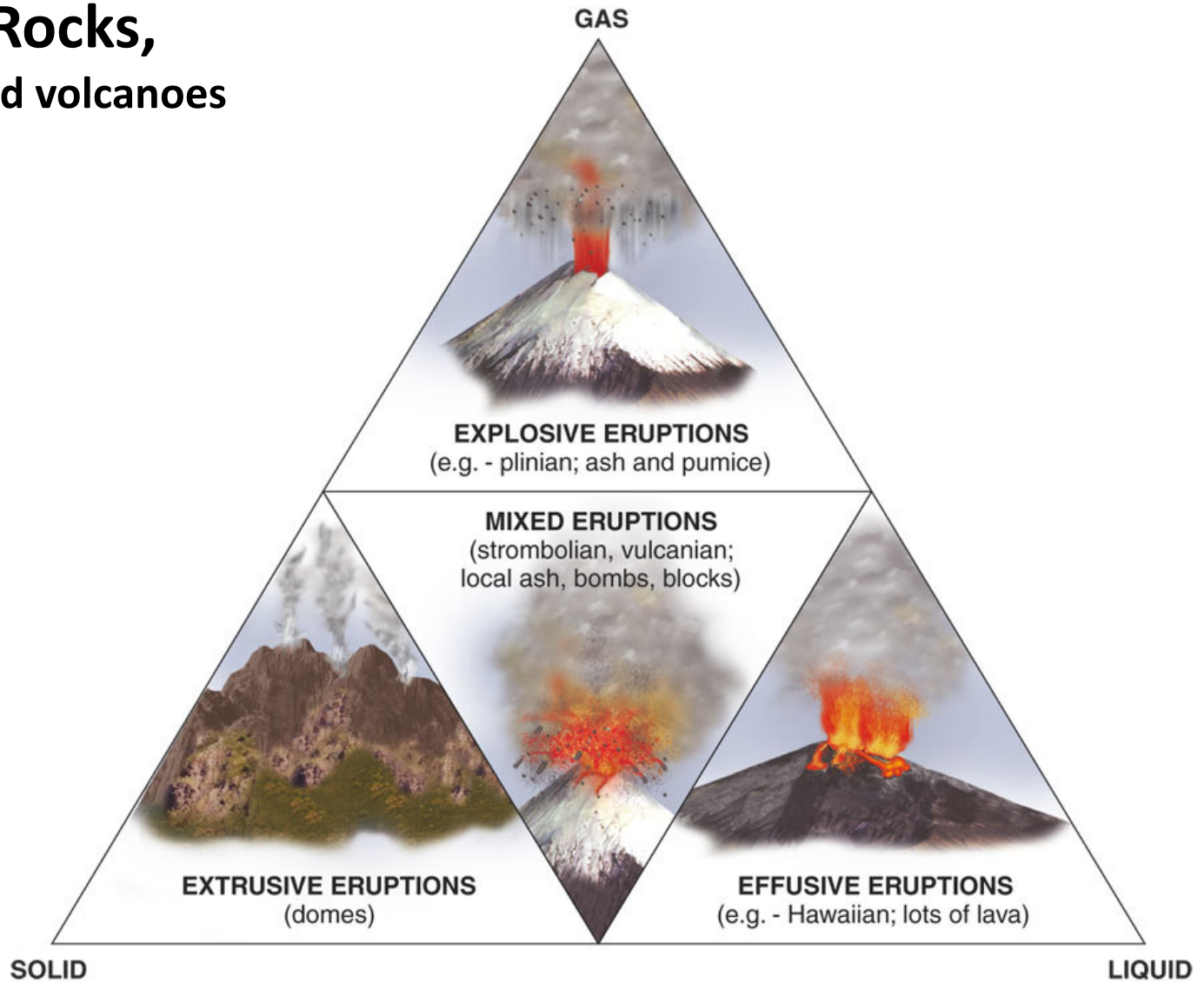


Volcanic Rocks and Volcanoes

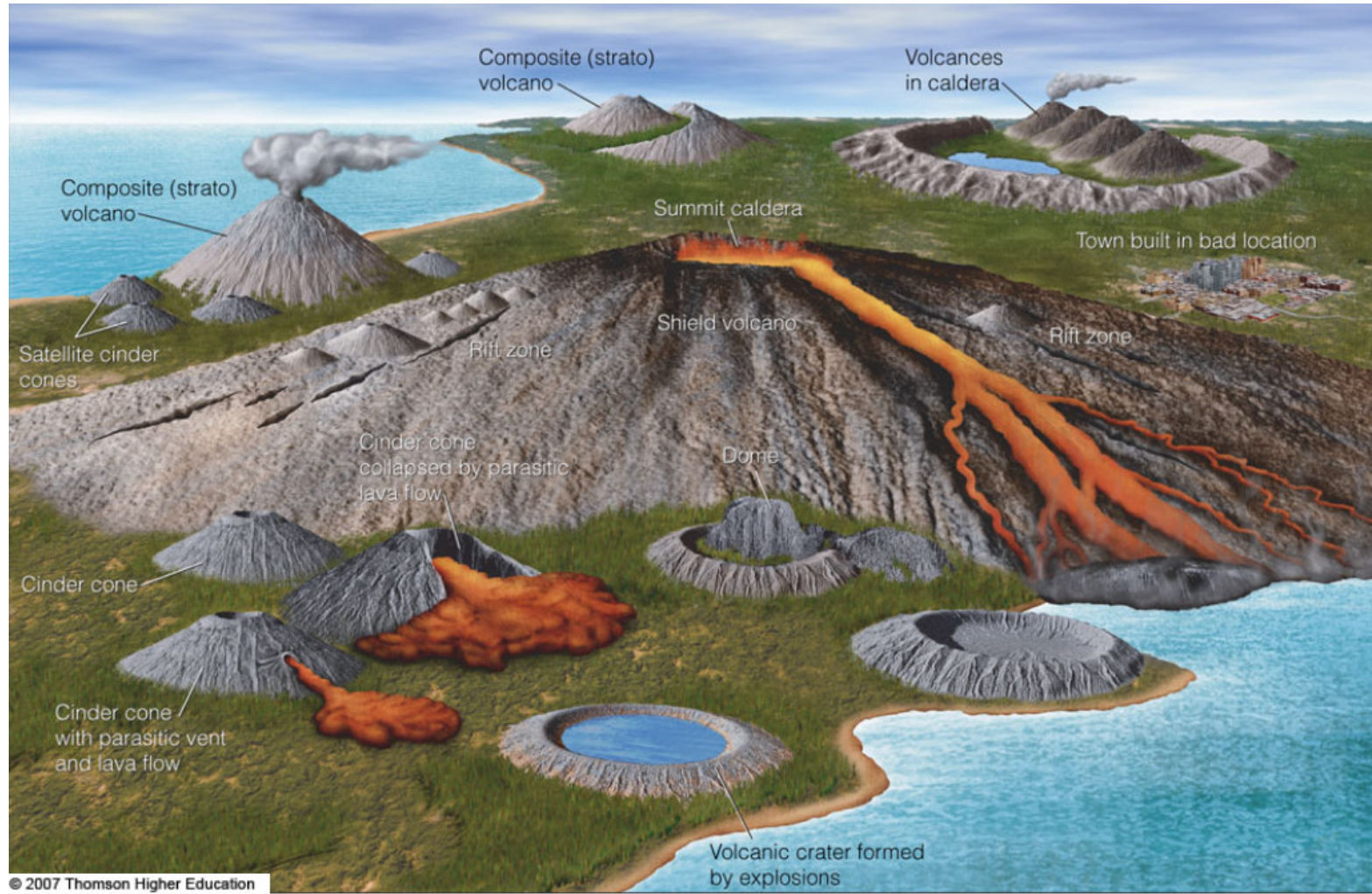
- Shield volcanoes have gentle slopes, rounded shapes and are composed largely of basaltic lava flows.
- Cinder cones consist of cinder-like pyroclastic materials accumulated as relatively small, steep-sloped cones.
- Composite volcanoes (stratovolcanoes) are comprised of lava flows of intermediate composition, and layers of pyroclastic debris and volcanic mud flows (lahars).



Volcanic Rocks, volcanism and volcanoes



Volcanic Rocks, volcanism and volcanoes



Volcanic Rocks, volcanism and volcanoes

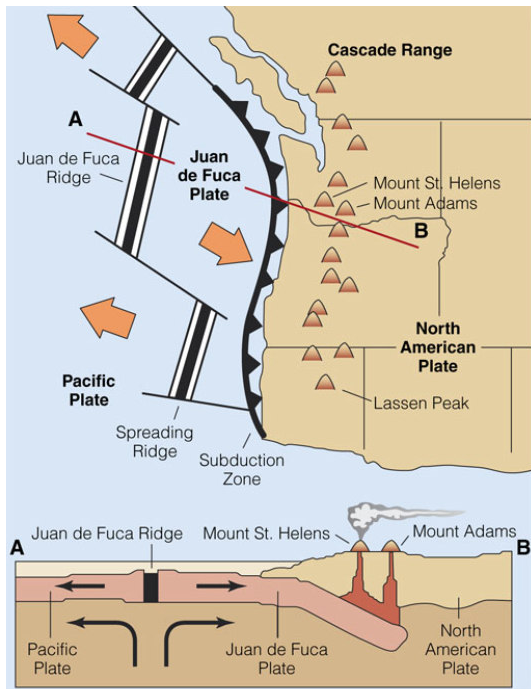
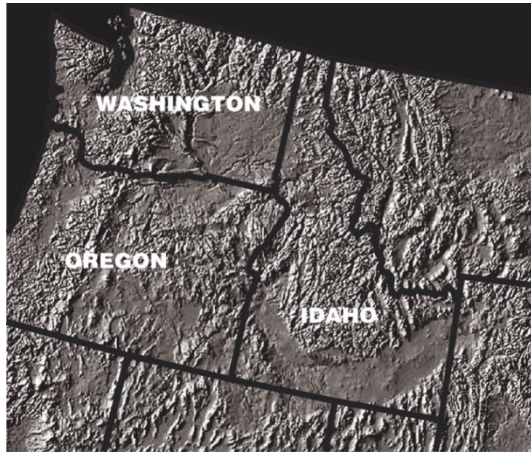


— Divergent plate boundary
(some transform plate boundaries)

- - - Convergent boundary

▲ Volcano

Volcanic Rocks, volcanism and volcanoes

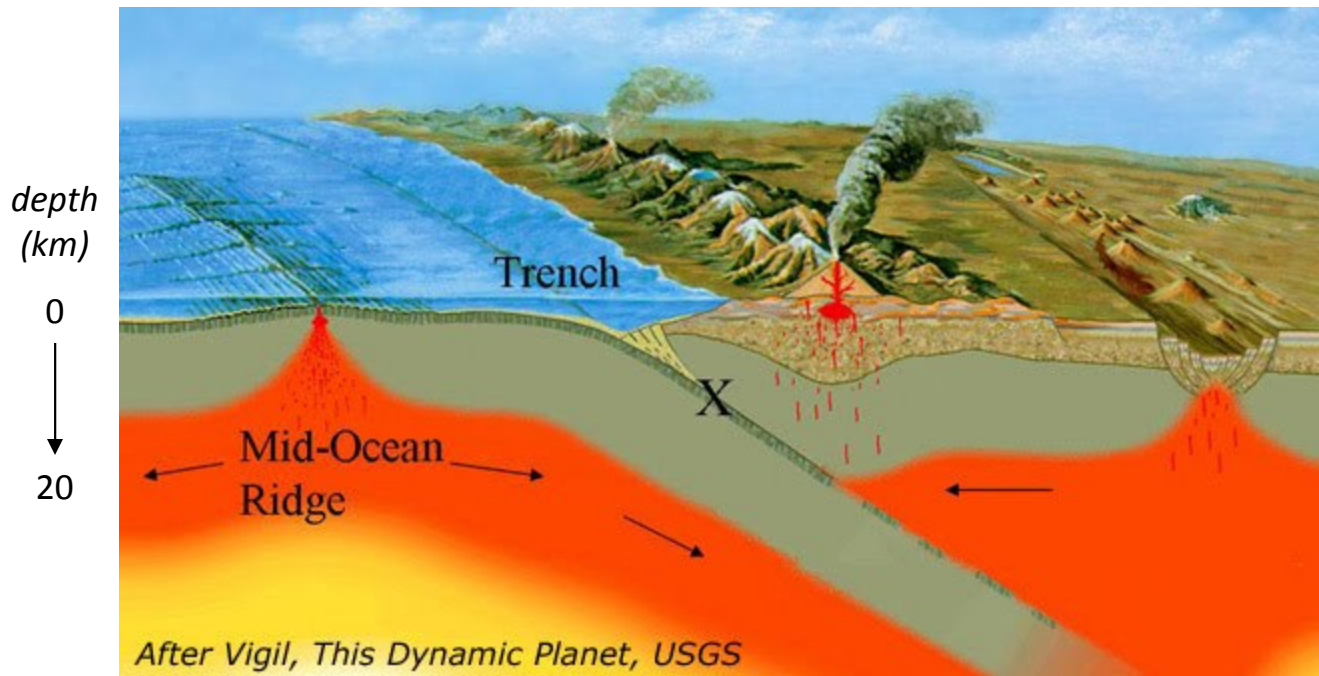


*Columbia River basalt group
Late Miocene – Early Pliocene (17 – 6 Ma)*

Igneous and Volcanic Rocks

- The production of magma and igneous activity is associated with plate tectonic boundaries, hot spots, and continental rifts

- Magmas accumulate in magma chambers at depths of a few kilometers below divergent boundaries and at tens of kilometers below convergent boundaries.



Magmas forms beneath spreading ridges as a result of mantle plumes and are mafic.

Along subduction zones at convergent boundaries, partial melting of the subducting plate produces intermediate to felsic magmas.