Geol 110
Earth Materials

Lecture: MWF 12:50- 1:40 p.m.

Lab: T 8:30 – 11:15 am OR Th 2:30 – 5:15 pm

Professor: Greg Druschel

Office: Delehanty 321

Office Hours : WF 2:30 – 3:30 pm

T.A.: Kyle Ashley

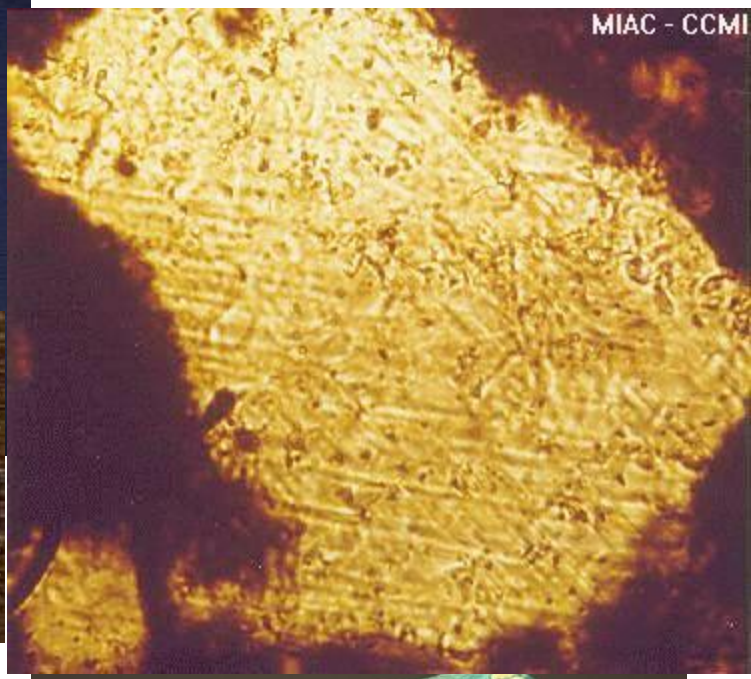
Class Goals

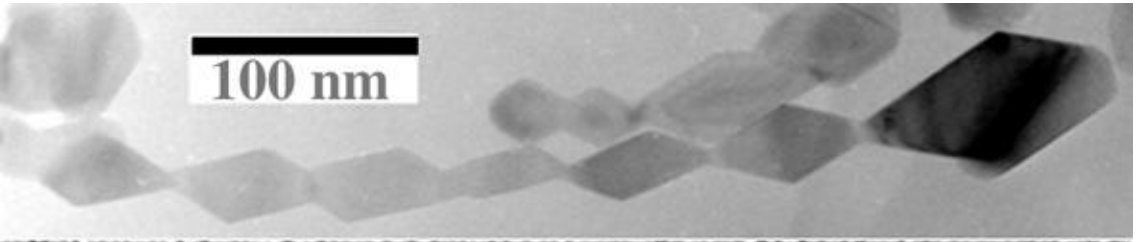
- Recognize major rock-forming minerals and other selected minerals in hand specimen and thin section
- Master use of several techniques for the identification of minerals using the petrographic microscope, Raman spectrometer, XRD, and XRF
- Develop the ability to relate crystal chemistry, crystallographic alignment, and physical attributes of a mineral to guide identification and assess a mineral's origin and history

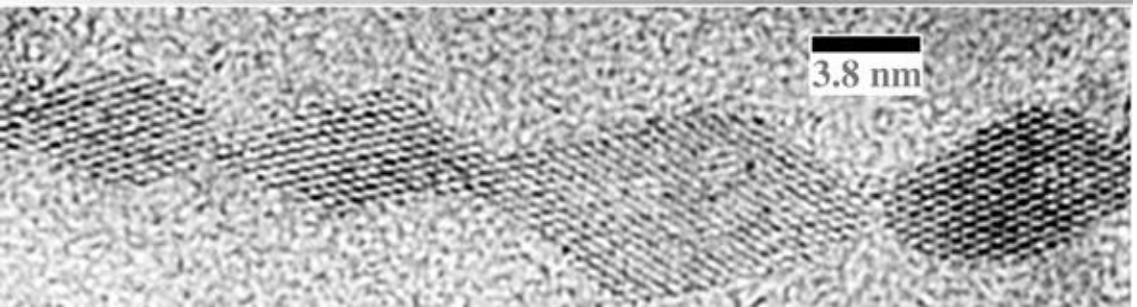
Grading

- Laboratories 30%
- Lab exam 10%
- Mid-term exam 20%
- Final exam 20%
- Homeworks 10%
- Participation 10 %

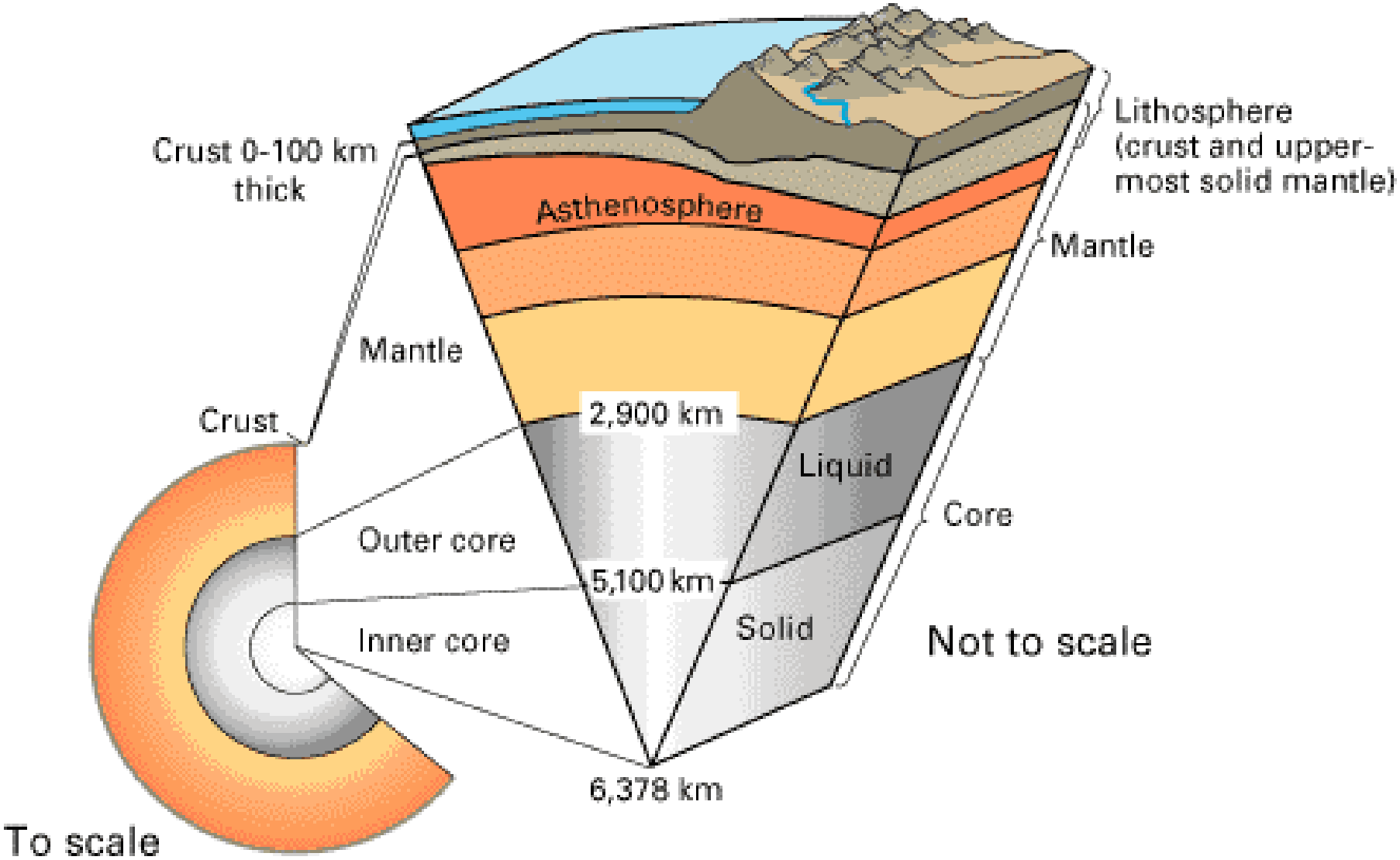
What is a mineral??



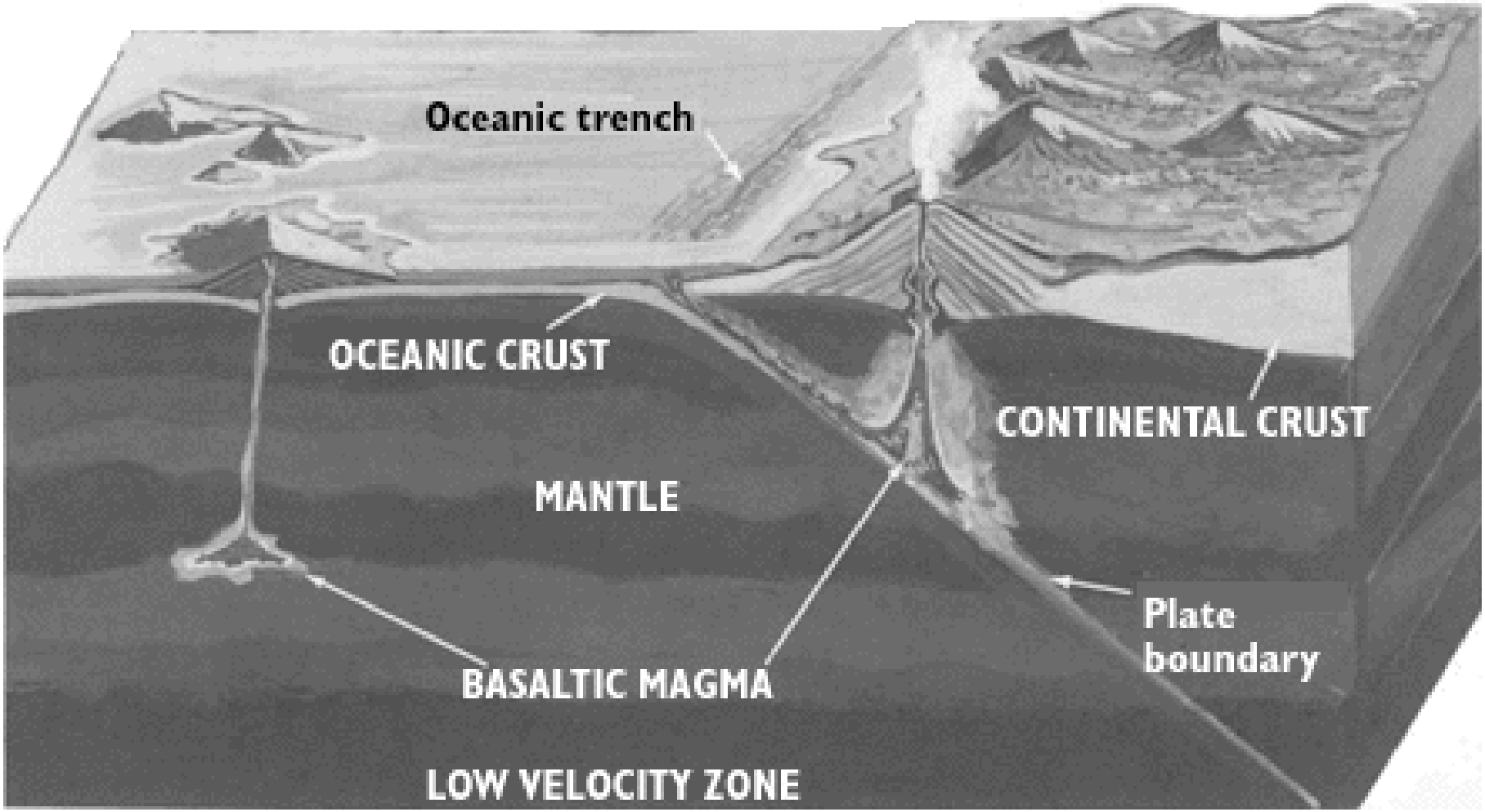


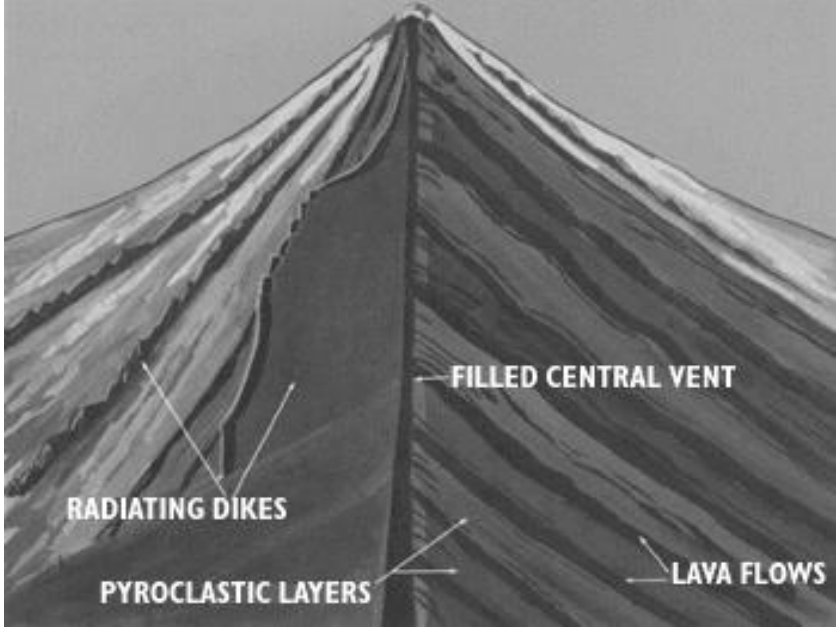


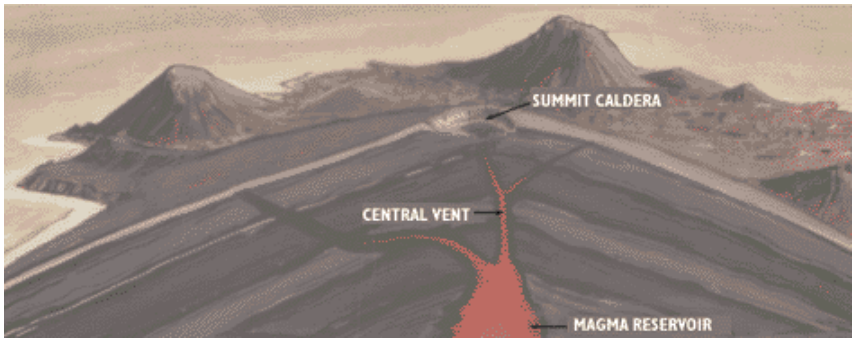
Structure of the Earth

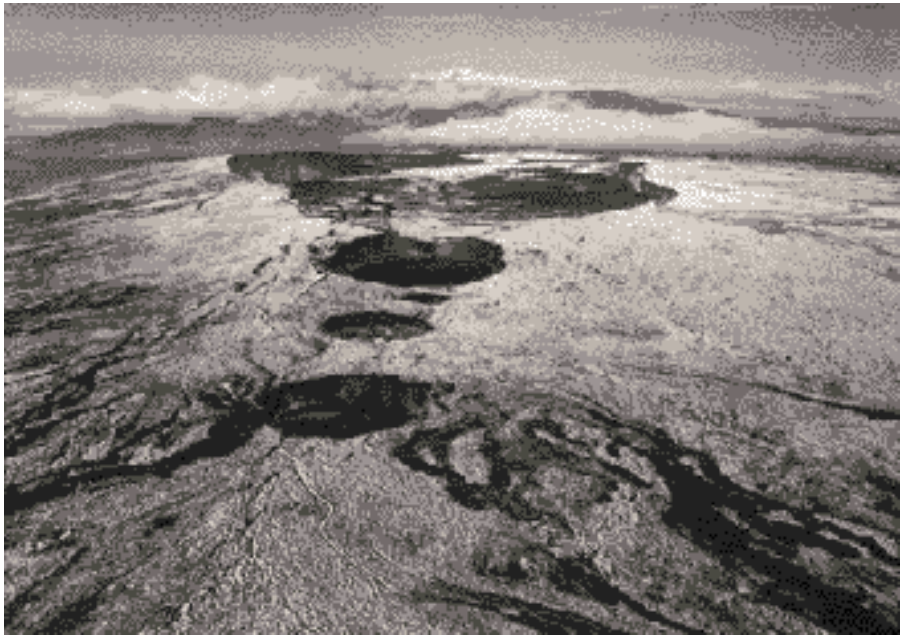


Volcanic provinces



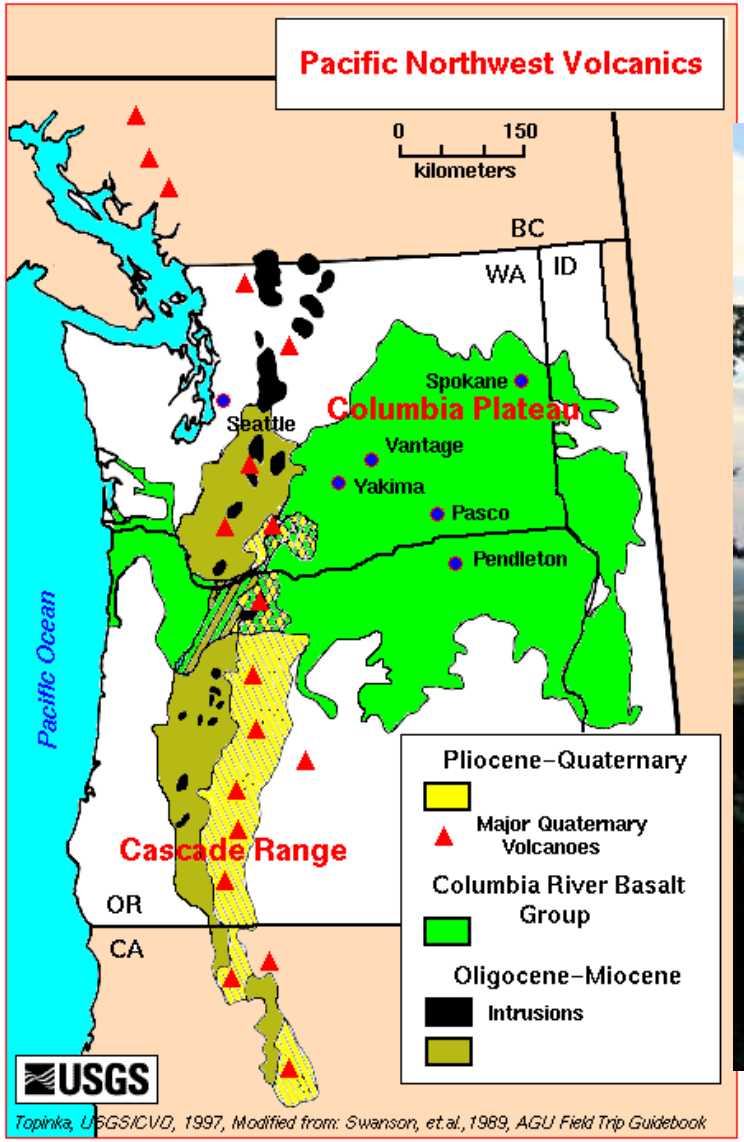

FILLED CENTRAL VENT
RADIATING DIKES
PYROCLASTIC LAYERS
LAVA FLOWS


SUMMIT CALDERA
CENTRAL VENT
MAGMA RESERVOIR

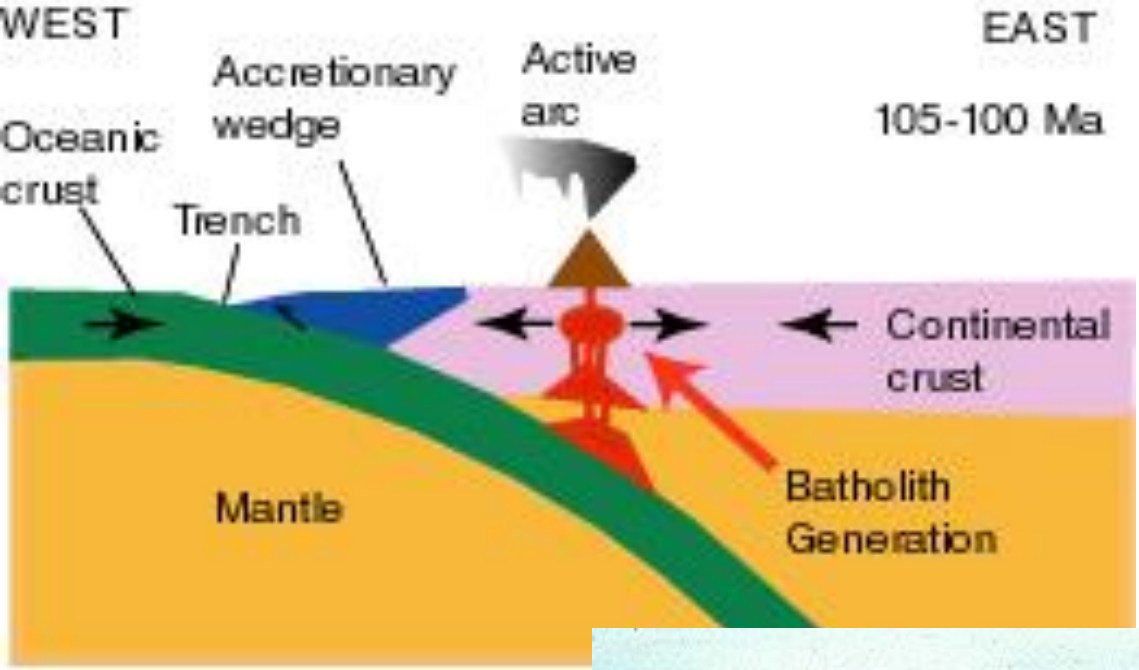


Mt. Pinatubo

Basalt flows



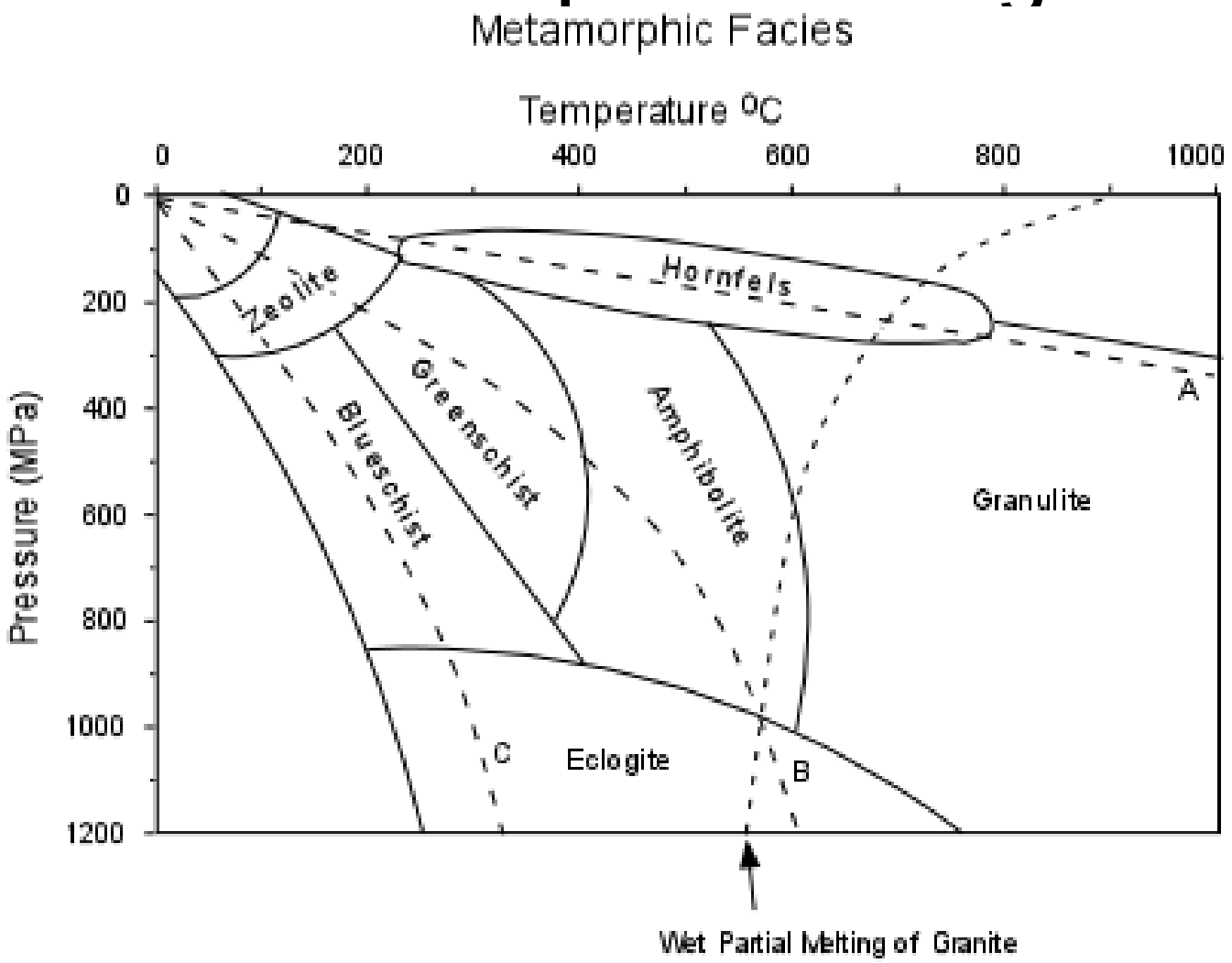
Plutons



Modified from Tobisch et al., 19

Intrusions

Metamorphic settings

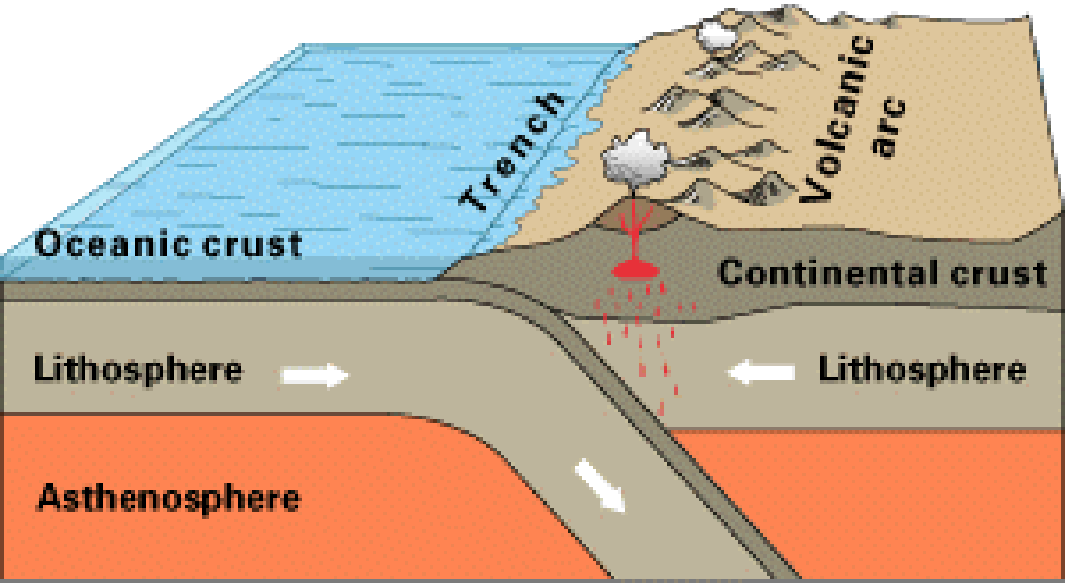


A= High Geothermal Gradient (contact metamorphism), Low P, High T

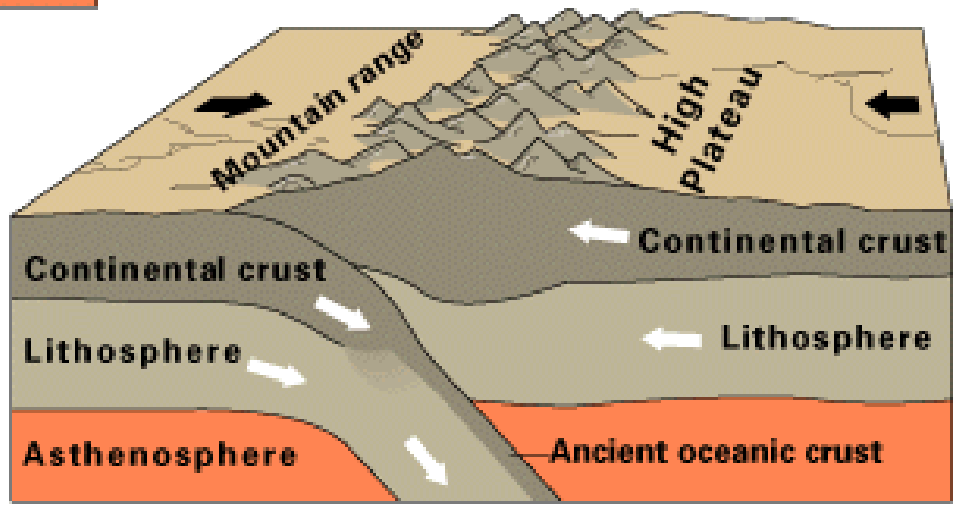
B = Normal Geothermal Gradient (regional metamorphism), High P, High T

C = Low Geothermal Gradient (subduction), High P, Low T

Orogenic settings

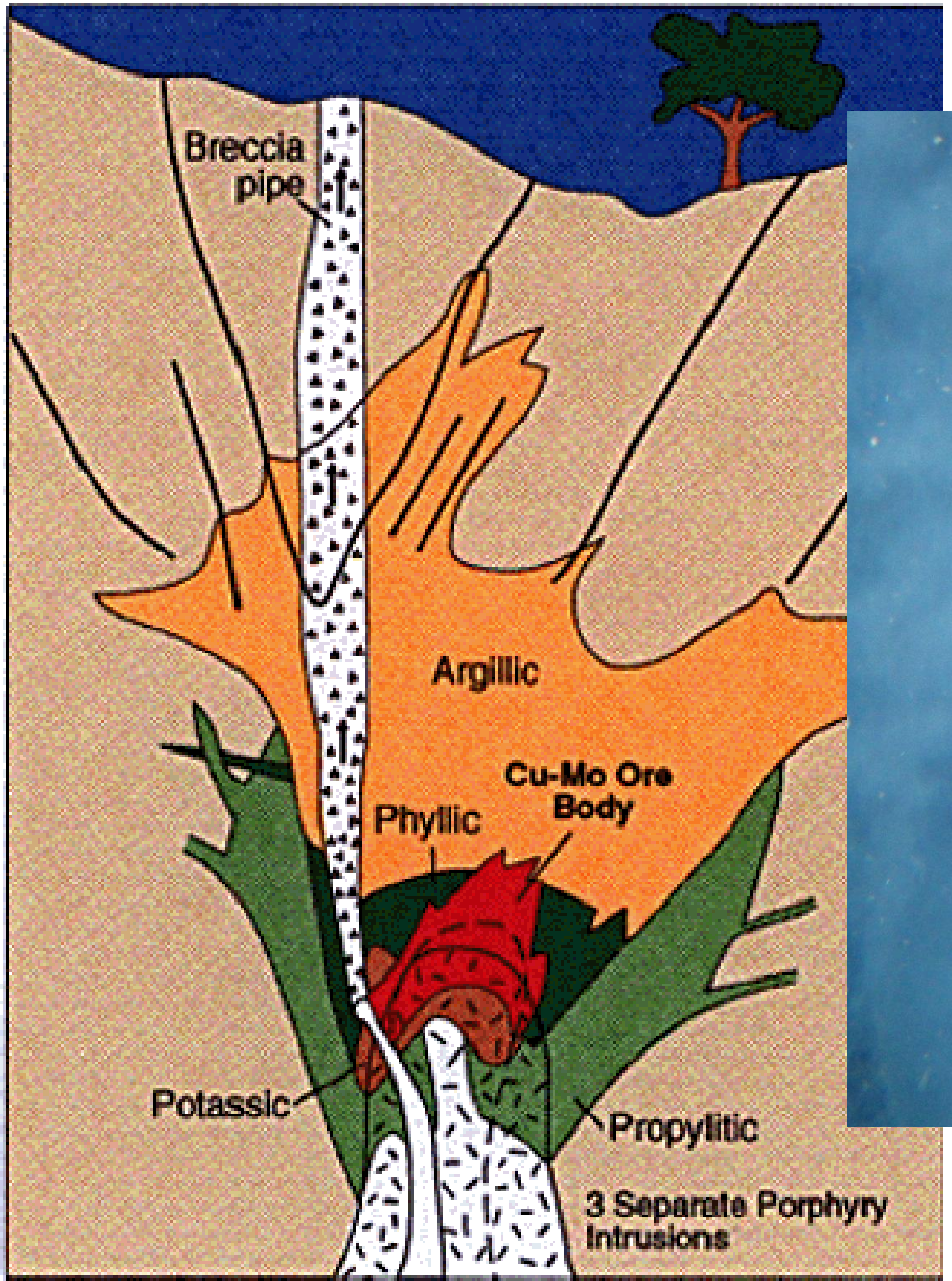


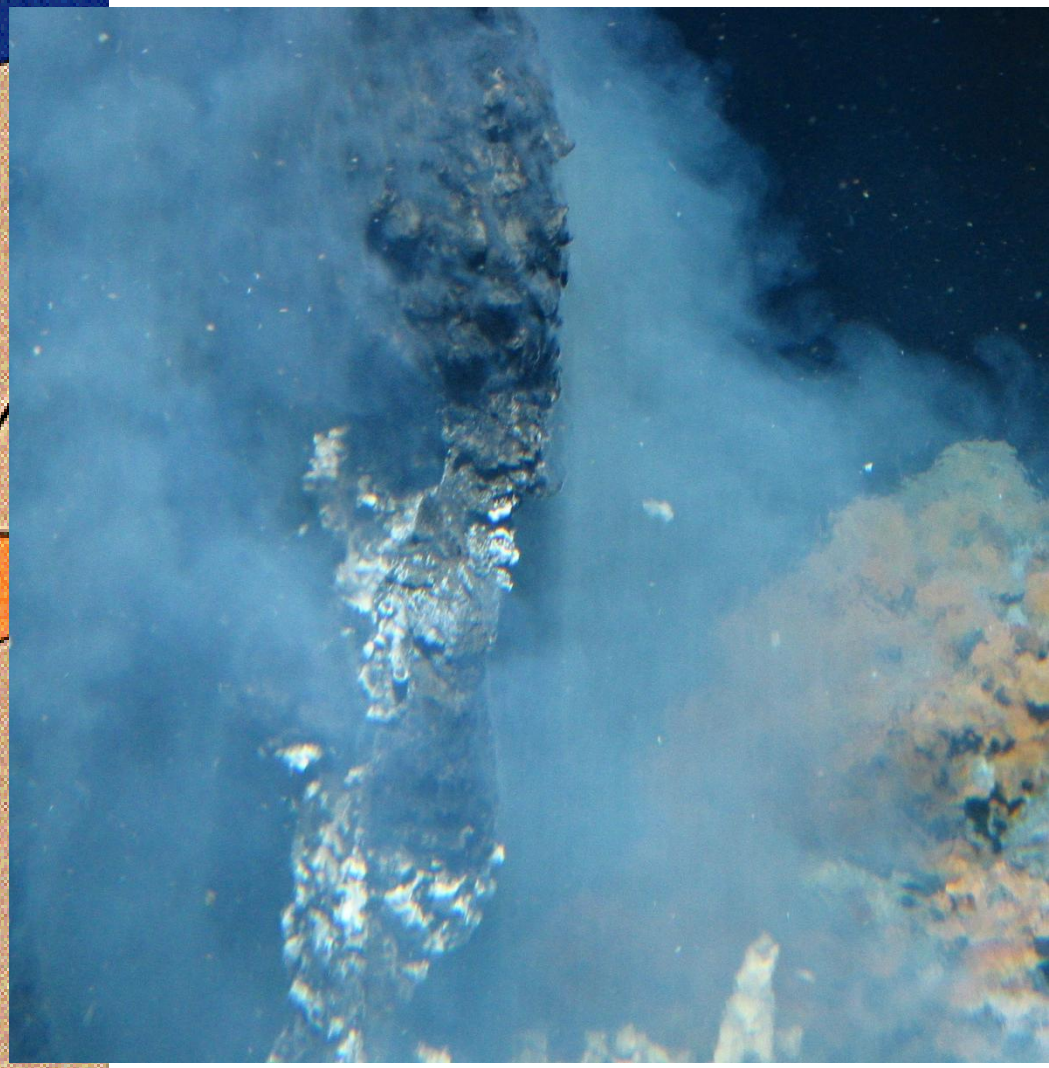
Oceanic-continental convergence



Continental-continental convergence

Ore deposits





Oil

Microfractures in organic rich shale. Hunt, 1995.

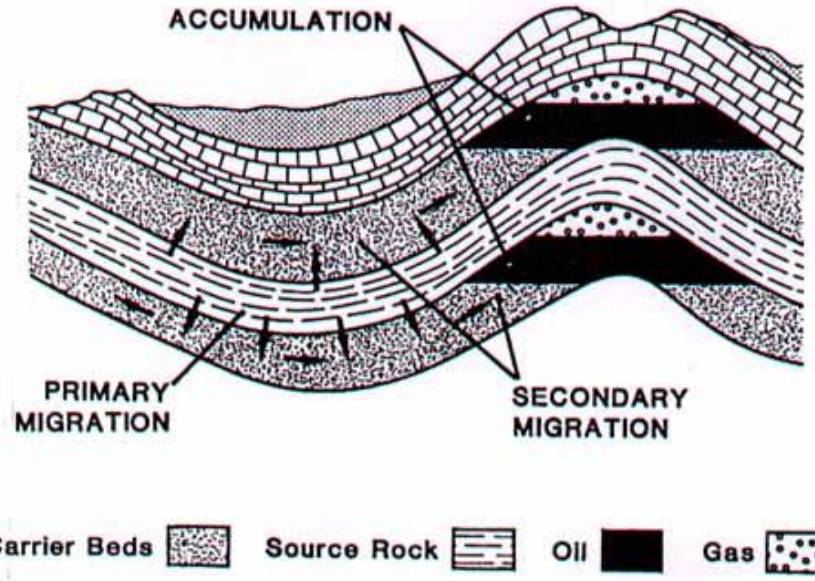
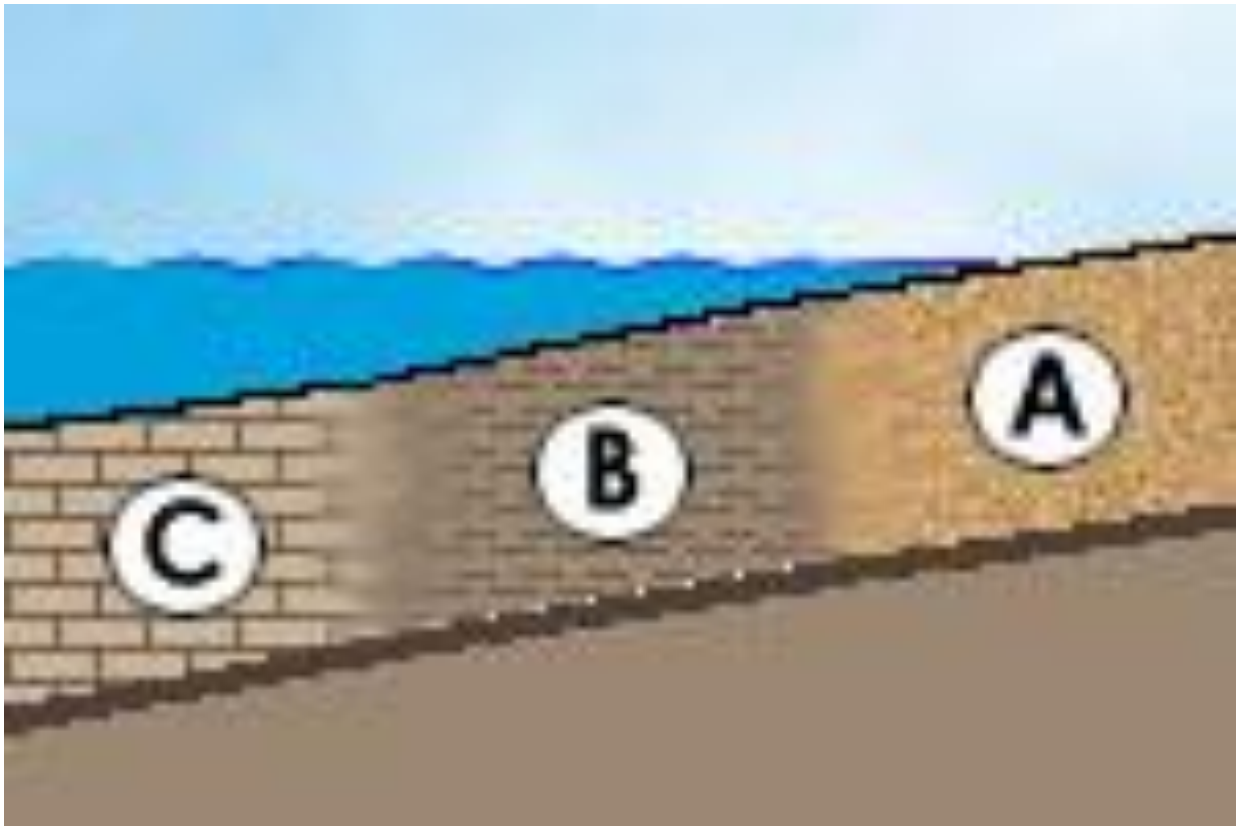


Figure 1. Definitions of primary and secondary migration. (After Tissot and Welte, 1984.)

Sedimentary deposition

- Weathering of any rock and transport of that material to lower E environment followed by lithification yields sed. rx



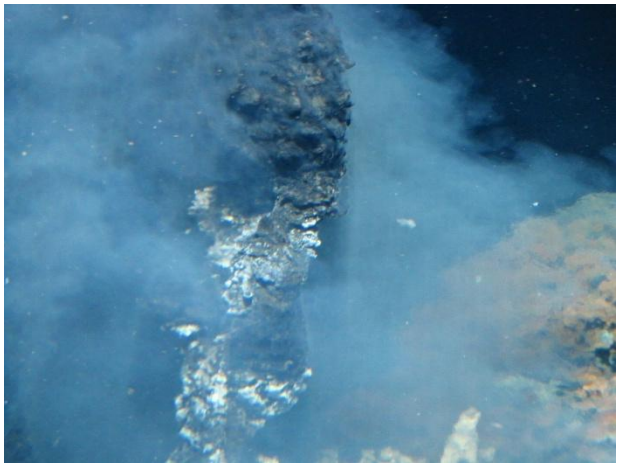
Depositional settings

- Keyed to transport of physical/ chemical components of parent material
- Tells 2 stories – who were the parents and how far away did it go?

Missisquoi Bay wetlands.

Chemical deposition

- Formation of minerals from aqueous solution requires some change in environment for the ions to precipitate

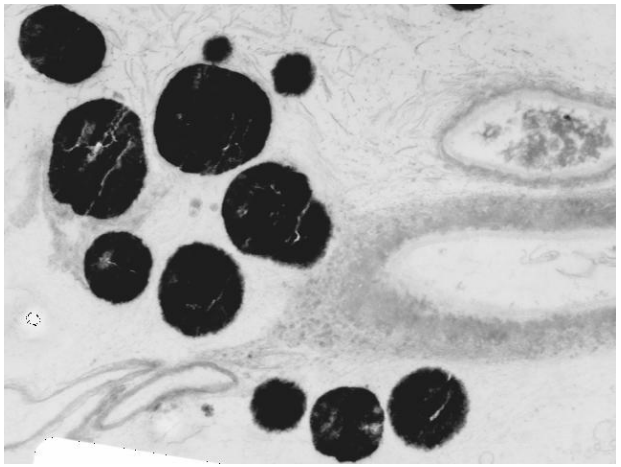


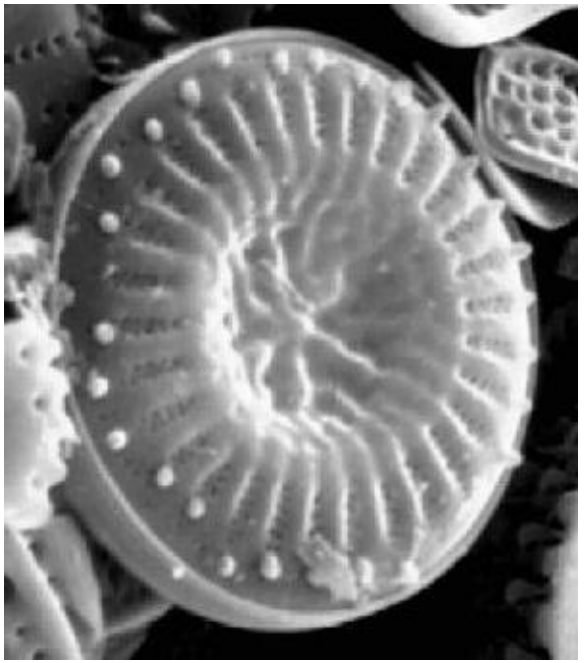
Fossils

- Here parent material were organisms – usually ones that were partially composed of a durable mineral material
- Requires a special depositional setting
  - Quick burial, fine/ chemical covering, replacement reactions
- Also tell us approximate age of deposition

Biominerals

- Microorganisms may also have a significant impact on mineralogy!





A word about classification…

- Umbrella terms
- Mineral nomenclature similar to the taxonomy of animals, plants, and microbes