Pages in Earth's Past

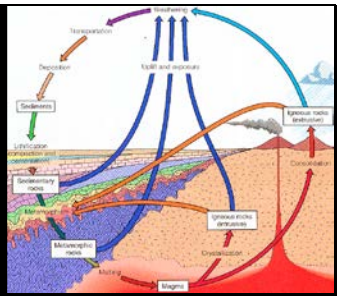
Sedimentary Rocks

Big ideas

- Natural hazards pose risks to humans.
- Our understanding of the Earth's climate system is improved through observations, theoretical studies and modeling.

  A record of the location, severity, and frequency of the Earth's natural hazards and past climates are preserved in the sedimentary rock record.

We are skipping
WEATHERING
& SOILS
for a bit…



Sediment

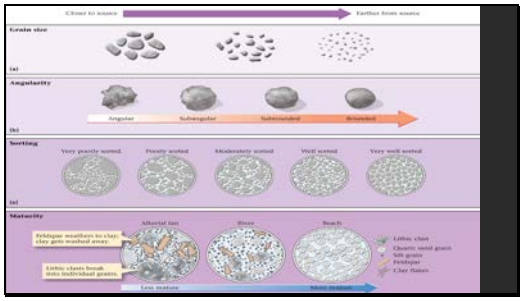
- Weathering VERSUS erosion
- Chemical precipitation

Sediment Texture (clast-size)

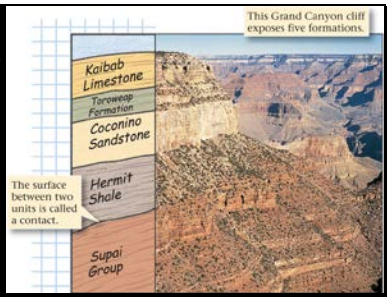
- Boulder
- Cobble
- Pebble
- Sand
- Silt
- Clay

Transportation

- Gravity
- Rivers
- Glaciers
- Waves
- Wind



Preservation of sediments



Preservation of sediments

- Problematic
  - There are gaps!
  - Years to millions of year missing?

WHY?

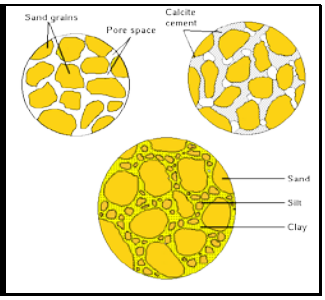
Lithification

Compaction

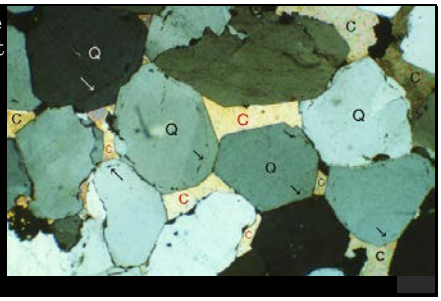
- Burial
- Compaction
- Decrease in pore size

Cementation

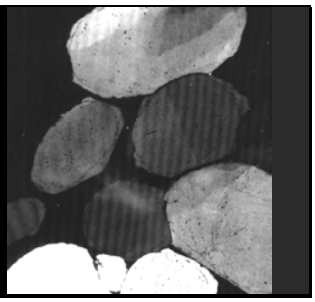
Water - Saturated with accessary minerals



Calcite cement



Quartz cement

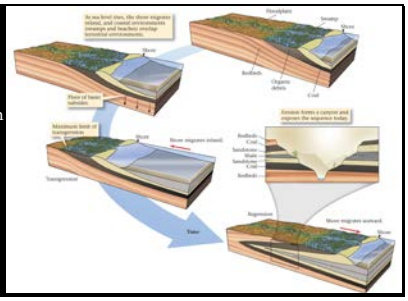


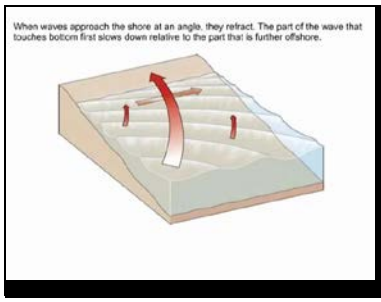
Marine

Transgression

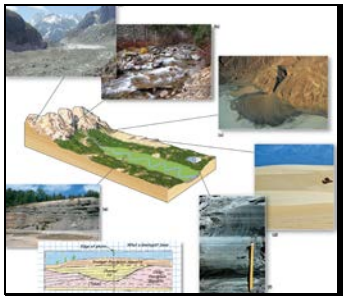
Vs.

Regression





Beach drift



Lateral Transitions

Hey, what's limestone anyway?

- **Limestone** = a biochemical sedimentary rock made up mostly of calcium carbonate

Mineral	Crystal system	Formula	Remarks
Calcite	Rhombohedral	$CaCO_3$	Dominant limestone mineral, especially in rocks older than Cenozoic
Aragonite	Orthorhombic	$CaCO_3$	Dominant mineral in Recent carbonate sediments; alters readily to calcite

How do limestones form?

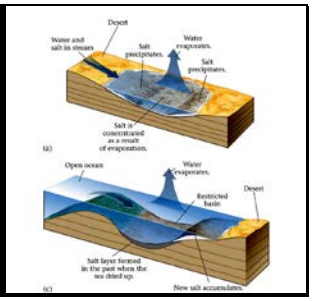
- Most limestones are simply the *cemented remains of marine shells*
- Limestone "anatomy"
  - **Grains**
    - Skeletal particles, ooids, peloids
  - **Lime mud**
    - Microscopic crystals produced by calcareous algae and through abrasion of larger particles
  - **Cement**
    - Inorganically precipitated $CaCO_3$ crystals

Where do limestones form?

- $CaCO_3$ precipitates most readily in warm, well lit, agitated water of normal marine salinity.
- *So, most limestones form in shallow, tropical depositional environments*
- e.g., Bahamas, central America, Persian Gulf, NW shelf of Australia, Great Barrier Reef, Malaysia, Indonesia, etc.

Evaporates

- Rock salt
- Rock gypsum



Memories of Past Environments and Life

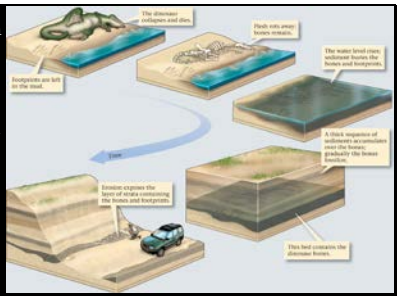
Fossils and Evolution

Preservation potential

A. Anoxic conditions

B. Rapid burial

C. Presence of hard parts



Fossilization

- Permineralization
- Freezing
- Compression
- Entrapment by amber

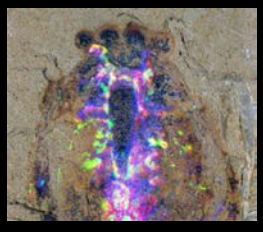
Body fossils

- Hard parts

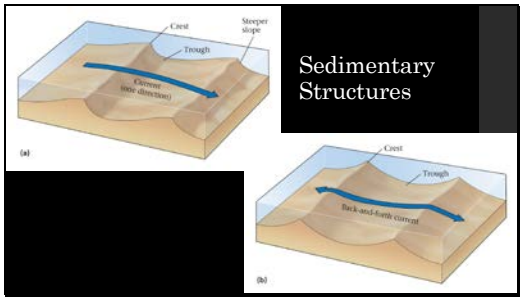
Soft Tissue

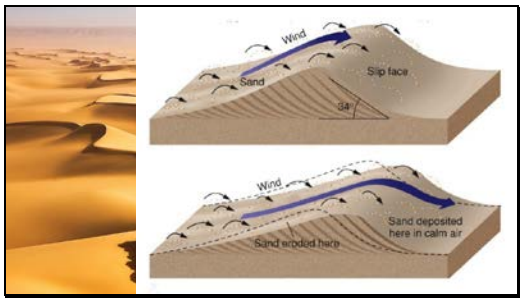
Trace fossils

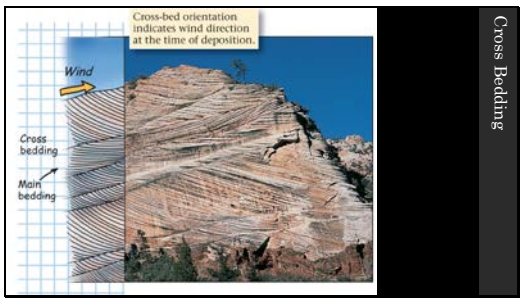
Chemical fossils




Sedimentary Structures


Crest
Steeper slope
Trough
Current (one direction)
(a)
Sedimentary Structures
Crest
Trough
Back-and-forth current
(b)


Wind
Sand
Slip face
34°
Wind
Sand deposited here in calm air
Sand eroded here



Cross Bedding

Mud cracks