# Essentials of Geology

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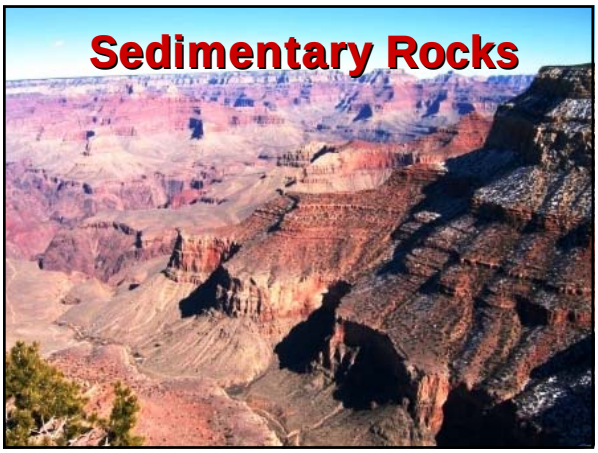
Chapter 6

# Sedimentary Rocks



## History of Sedimentary Rocks

Sedimentary rocks make up about 75% of the surface of the continents even though they make up only a small part of the continental crust. Many times in the past the continents have been covered by shallow, warm seas which deposited thick sequences of sediments.

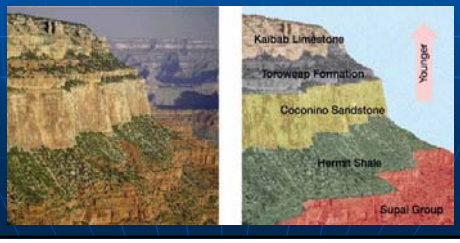

http://www.calstatela.edu/faculty/acolvil/weathering.html

## History of Sedimentary Rocks

The environment of sedimentation can usually be determined. Sediments are deposited in a variety of depositional environments such as river channels, flood plains, deltas, sand dunes & alluvial fans as well as lakes, swamps and estuaries. Marine environments include beaches, shallow marine, deep marine, reefs, bays

## History of Sedimentary Rocks

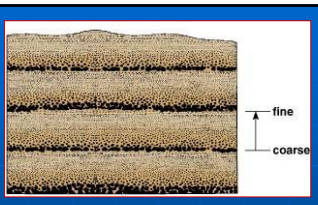
Law of superposition: An important principle used to interpret sedimentary rocks. It states that younger rocks are deposited on top of older ones.




## Sedimentary Structures

1. Stratification - Sedimentary rocks are bedded or layered because the agents of deposition carry different materials at different times. Different kinds of stratification are indicative of different environments of sedimentation.

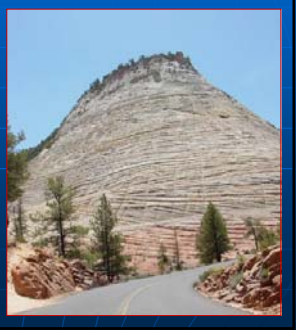
## Sedimentary Structures




2. Graded bedding: In these the grain size changes from finer at the top to coarser at the bottom. This often occurs when a large amount of sediment is suspended in water (as in a submarine landslide into deep water). The larger particles sediment faster than finer particles in water. Or when a river slows down, again the larger particles settle faster.

## Sedimentary Structures

3. Cross-bedding: Wind or water may deposit material across sloping surfaces during sedimentation. This occurs because both these agents deposit material on sloping surfaces. Because rivers cut and fill in response to different velocities, the cross beds are usually relatively thin and not well sorted. In wind-deposited sand the layers are thicker and very well sorted.



## Sedimentary Structures

4. Ripple marks: These are like micro sand dunes and are produced by flow of water over fine sediment. It could be wave action or running water. They are usually asymmetric in cross section because of the flow of water in one direction. They are indicative of a relatively shallow environment of deposition.

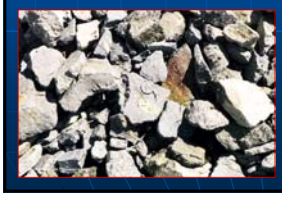
5. Mud cracks: When fine grained sediment dries out, it shrinks and forms polygonal mud cracks on the surface. The environment could be a flood plain, a tidal flat or the bottom of a dried up lake.

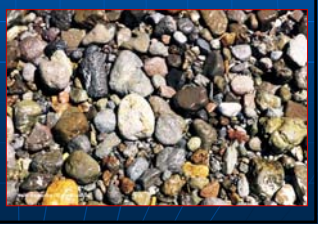
## Sediment and Sedimentary Rocks

- Sediment
  - Mechanical and chemical weathering produces the raw materials for soil and sedimentary rock
  - Sediment may be detrital or chemical, and sedimentary rocks may form by the deposition of particles or by biologic activity
  - Detrital sedimentary particles and the rocks they form are classified according to size
    - Gravel - >2mm in diameter
    - Sand - 1/16mm to 2 mm
    - Silt - 1/256mm to 1/16mm
    - Clay - <1/256mm

## Sediment and Sedimentary Rocks

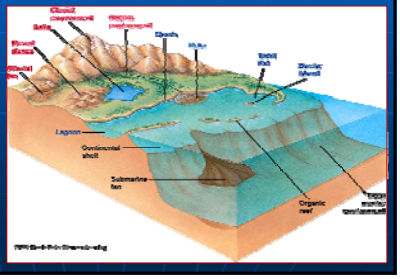
- Sediment Transport and Deposition
  - Ice, water, and wind can all transport particles of various sizes to another location
  - Abrasion and rounding
  - Sorting





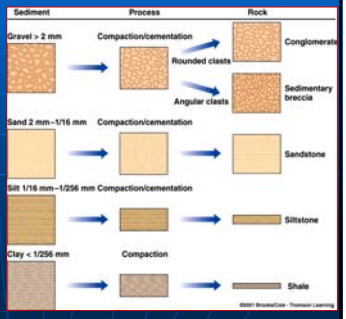
## Sediment and Sedimentary Rocks

- Sediment Transport and Deposition
  - Sediment can be carried a considerable distance from its source, eventually coming to rest in a depositional environment
  - Continental
  - Transitional
  - Marine



## Sediment and Sedimentary Rocks

- Lithification--Transforming Sediment into Sedimentary Rock
  - Compaction
    - reduction in pore space and volume
  - Cementation
    - reduction in pore space, increase in mechanical strength
    - common cementing agents include: calcite, silica, iron oxide




## What Kinds of Sedimentary Rocks do Geologists Recognize?

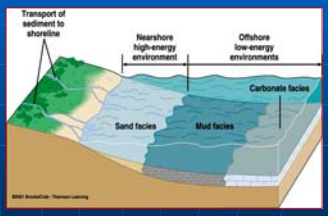
- Detrital Sedimentary Rocks
  - Clastic texture, classified by size and shape
  - Conglomerate, breccia, sandstone, siltstone, shale are common

## What Kinds of Sedimentary Rocks do Geologists Recognize?

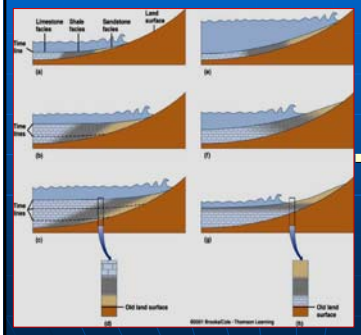
- Chemical and Biochemical Sedimentary Rocks
  - Consist of ions and compounds released by chemical weathering and precipitated by chemical reactions or by the metabolism of organisms
  - Carbonates
    - Limestones, dolostones
  - Evaporites
    - Halite, gypsum
  - Coal

## Sedimentary Facies

- Deposits of sediment that have distinctive physical, chemical, or biological attributes
  - Coarse-grained deposits in a high-energy depositional environment are adjacent to finer-grained sediments that are deposited in quieter water
  - Facies are typically recognized by grain size



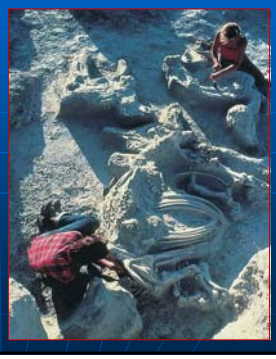

## Sedimentary Facies



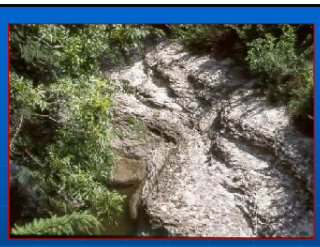
- Transgression
  - Rise in sea level relative to land, results in offshore facies being deposited over nearshore facies
- Regressions
  - Fall in sea level relative to land, results in nearshore facies being deposited over offshore facies.

## Reading the Story in Sedimentary Rocks

- Fossils--Remains and Traces of Ancient Life
  - Most organisms are uniquely adapted to their habitat, and the structure of fossil organisms and comparison to any living relatives is useful in determining ancient depositional environments



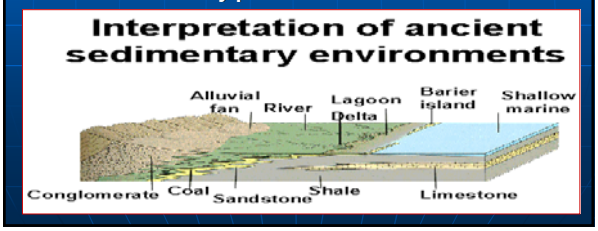
## Where can you find fossils?



Fossils are often found where rock surfaces are being freshly eroded. Creek beds, road cuts, quarries, are all potential fossil sites…if they are exposing sedimentary rocks.

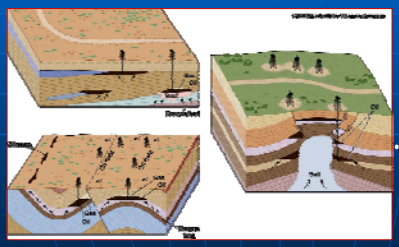
## Reading the Story in Sedimentary Rocks

- Determining the Environment of Deposition
  - Geologists attempt to make interpretations about ancient environments based on analyses of rocks, fossils, and sedimentary structures and comparison with modern day processes




## Resources in Sedimentary Rocks

- Petroleum and Natural Gas
  - Hydrocarbons that originate from the microscopic remains of marine organisms
  - They migrate upward through porous rock until they encounter a structural or stratigraphic trap



## Resources in Sedimentary Rocks

http://www.window.state.tx.us/lga/wotlg/wotlg0606/shale.html

Barnett Shale is now the largest gas field in Texas and one of the largest in the nation. It generally includes Denton, Wise, Parker, Tarrant and Johnson counties

## Resources in Sedimentary Rocks

- Uranium
  - Most uranium used in North American nuclear reactors comes from carnotite, a mineral found in sedimentary rocks
- Banded Iron Formation
  - Alternating layers of chert and iron oxide account for most of the iron mined today