

Introduction to Sedimentary Rocks

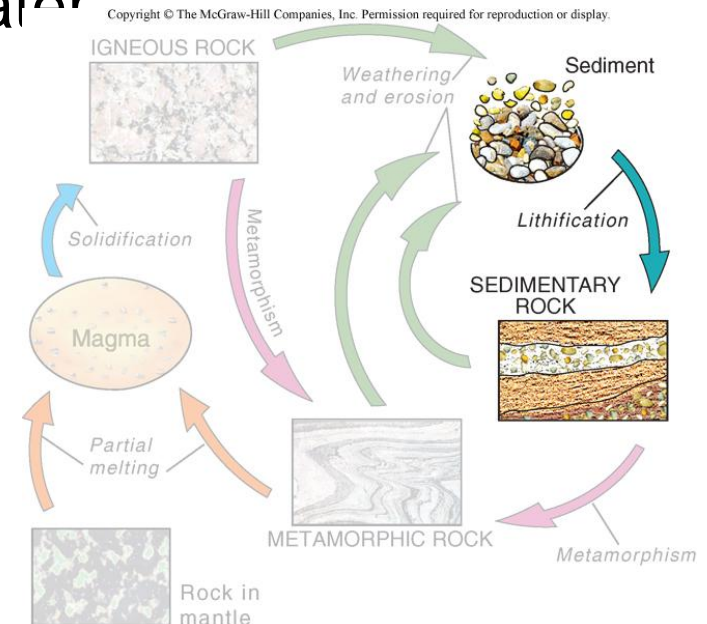
Intro to Sedimentary Rocks

- Produced from *weathering products* of pre-existing rocks or accumulated *biological matter*
 - *Detrital* (clastic) rocks produced from rock fragments
 - *Chemical* rocks produced by precipitation of dissolved ions in water
 - *Organic* rocks produced by accumulation of biological debris, such as in swamps or bogs
- Sedimentary rock types and *sedimentary structures* within the rocks give clues to *past environments*
- *Fossils* in sedimentary rocks give clues to the history of life
- Important *resources* (coal, oil) are found in sedimentary rocks

Sediment

- *Sediment* - loose, solid particles originating from:
 - Weathering and erosion of pre-existing rocks
 - Chemical precipitation from solution, including secretion by organisms in water
- Classified by *particle size*
 - Boulder - >256 mm
 - Cobble - 64 to 256 mm
 - Pebble - 2 to 64 mm
 - Sand - 1/16 to 2 mm
 - Silt - 1/256 to 1/16 mm
 - Clay - <1/256 mm

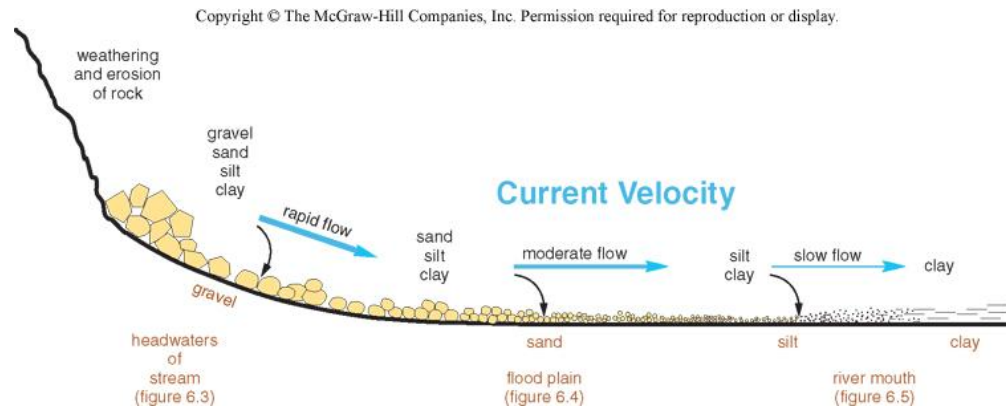
Gravel



From Sediment to Sedimentary Rock

- *Transportation*

- Movement of sediment away from its source, typically by water, wind, or ice
- *Rounding* of particles occurs due to abrasion during transport
- *Sorting* occurs as sediment is separated according to grain size by transport agents, especially running water
- Sediment size decreases with increased transport distance



From Sediment to Sedimentary Rock

- *Deposition*

- Settling and coming to rest of transported material
- Accumulation of chemical or organic sediments, typically in water
- *Environment of deposition* is the location in which deposition occurs
 - Deep sea floor
 - Beach
 - Desert dunes
 - River channel
 - Lake bottom



From Sediment to Sedimentary Rock

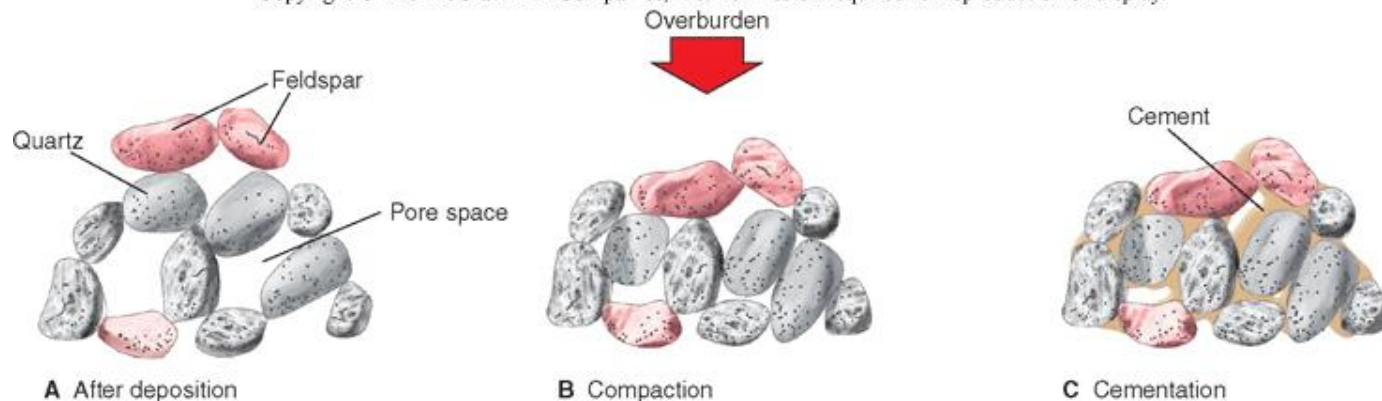
- *Preservation*

- Sediment must be preserved, as by burial with additional sediments, in order to become a sedimentary rock

- *Lithification*

- General term for processes converting loose sediment into sedimentary rock
- Combination of *compaction* and *cementation*

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Types of Sedimentary Rocks

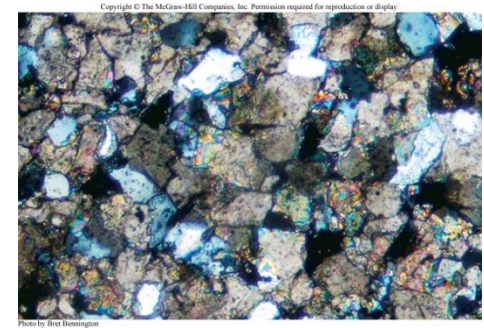
- *Detrital (clastic) sedimentary rocks*

- Most common sedimentary rock type
- Form from cemented sediment grains that come from pre-existing rocks



- *Chemical sedimentary rocks*

- Have crystalline textures
- Form by precipitation of minerals from solution



- *Organic sedimentary rocks*

- Accumulate from remains of organisms



Clastic Sedimentary Rocks

- *Breccia and Conglomerate*

- *Coarse-grained clastic* sedimentary rocks
- Sedimentary breccia composed of coarse, *angular rock fragments* cemented together
- Conglomerate composed of *rounded gravel* cemented together



- *Sandstone*

- *Medium-grained clastic* sedimentary rock
- Types determined by composition
 - *Quartz sandstone* - >90% quartz grains
 - *Arkose* - mostly feldspar and quartz grains
 - *Graywacke* - sand grains surrounded by dark, fine-grained matrix, often clay-rich



Clastic Sedimentary Rocks

- *Shale*

- Fine-grained clastic sedimentary rock
- Splits into thin layers (*fissile*)
- Silt- and clay-sized grains
- Sediment deposited in lake bottoms, river deltas, floodplains, and on deep ocean floor



- *Siltstone*

- Slightly coarser-grained than shales
- Lacks fissility

- *Claystone*

- Predominantly clay-sized grains; non-fissile

- *Mudstone*

- Silt- and clay-sized grains; massive/blocky



Chemical Sedimentary Rocks

- *Carbonates*

- Contain CO_3 as part of their chemical composition
- *Limestone* is composed mainly of *calcite*
 - Most are *biochemical*, but can be *inorganic*
 - Often contain easily recognizable fossils
 - Chemical alteration of limestone in Mg-rich water solutions can produce *dolomite*



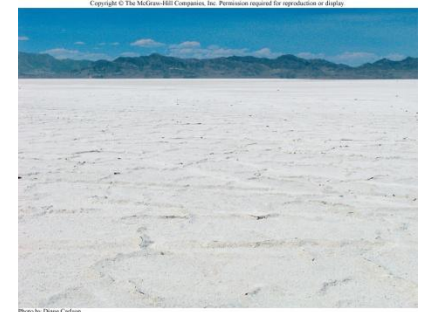
- *Chert*

- Hard, compact, fine-grained, formed almost entirely of silica
- Can occur as layers or as lumpy nodules within other sedimentary rocks, especially limestones



- *Evaporites*

- Form from evaporating saline waters (lake, ocean)
- Common examples are rock gypsum, rock salt



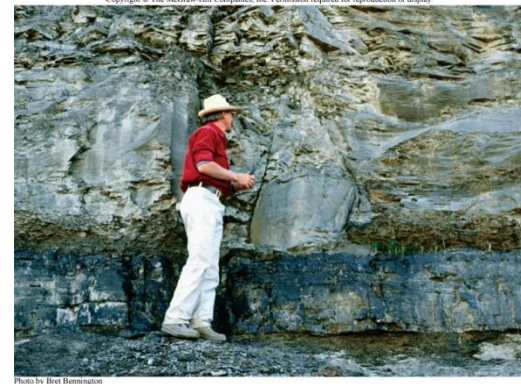
Organics in Sedimentary Rocks

- *Coal*

- Sedimentary rock forming from compaction of partially decayed plant material
- Organic material deposited in water with low oxygen content (i.e., stagnant)

- *Oil and natural gas*

- Originate from organic matter in marine sediment
- Subsurface “cooking” can change organic solids to oil and natural gas
- Can accumulate in porous overlying rocks



Sedimentary Structures

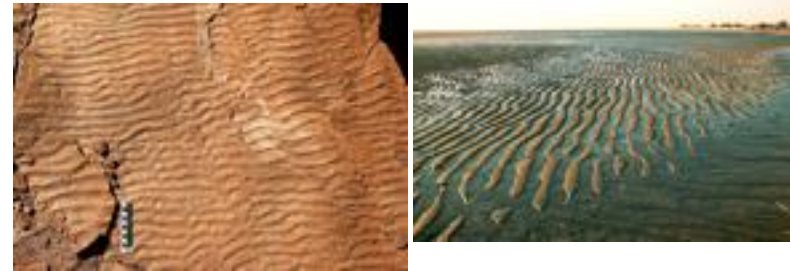
- *Sedimentary structures*
 - Features within sedimentary rocks produced during or just after sediment deposition
 - Provide clues to how and where deposition of sediments occurred
- *Bedding*
 - Series of visible layers within a rock
 - Most common sedimentary structure
- *Cross-bedding*
 - Series of thin, inclined layers within a horizontal bed of rock
 - Common in sandstones
 - Indicative of deposition in ripples, bars, dunes, deltas



Sedimentary Structures

- *Ripple marks*

- Small ridges formed on surface of sediment layer by moving wind or water



- *Graded bedding*

- Progressive change in grain size from bottom to top of a bed



- *Mud cracks*

- Polygonal cracks formed in drying mud



- *Fossils*

- Traces of plants or animals preserved in rock
- Hard parts (shells, bones) more easily preserved as fossils

