

- Sedimentary Processes
 - o Why do we care?
 - Sedimentary rocks are the most common rock type at Earth's surface
 - We utilize them for many things:
 - Construction and building materials
 - Almost all fossils are found in sedimentary rocks
 - Fossil fuels, like coal and natural gas, come from sed. Rocks
 - Soils are associated with sedimentary processes
 - Landslides involve sedimentary processes

Forming Sedimentary Rocks

- Start with some pre-existing rock (**Parent rock**)
 - o Does not matter what type
- Have to destroy parent rock to create raw material for building new rock
- **Weathering**=breakdown of rock into particles (sediment)
 - o 1. **Physical weathering**: mechanically or physically breaking down the rock (roll down hill)
 - **frost wedging**: when water freezes, it expands, so the ice presses against the sides of the crack, making it wider
 - each time water gets in the crack and freezes, the crack widens until it finally splits.
 - Ex- pot holes in the winter time
 - o **Chemical weathering**: chemically alter the rock to break it down (dissolve in acid)
 - More common than physical weathering in many environments
 - Remember: different minerals will react at different rates
 - Notice the last minerals to form in Bowen's Reaction Series are the most stable at earth's surface
 - They form at near surface conditions, and are thus hard to break down
 - Notice the first minerals to form in BRS are the least stable at earth's surface
 - They form at T/P conditions very different from earth's surface, so they are less stable and easier to alter
 - Water is key for many chemical weathering reactions
 - Rain isn't pure water
 - o Contains dissolved CO₂, SO₂, nitrates
 - o $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$ (=Carbonic acid)

- o Feldspar + H₂O + H₂CO₃ → kaolinite + dissolved ions
- o So you can change feldspar (hardness 6) into kaolinite (hardness 1.5) with a little water and acid
- o **Erosion:** moving sediment from one place to another
 - 4 things in nature commonly cause erosion
 - water
 - wind
 - gravity (landslides)
 - ice (glaciers)
 - Erosion requires energy to lift and move the sediment
- o **Deposition**
 - As energy levels drop, sediment can't be carried any further. It must be put down
 - **Basin:** any natural depression that can hold sediment
 - **Accommodation space:** the amount of space available in a basin to hold the sediment
 - **Subsidence:** as sediment is deposited, its weight may cause the basin to sink
 - This can open new accommodation space at the top of the basin
 - Sediment is deposited in layers (**strata, beds**)
 - Each bed can be named to help geologists communicate easier; they'll know exactly which bed other geologists are talking about.
- o **Lithification:** process of becoming solid rock
 - **Compaction:** squashing the particles of sediment closer together
 - When first deposited, plenty of space between the grains
 - As the stratum gets buried, the weight of the overlying beds compacts the grains, so little space is left between them
 - **Cementation:** the grains must be stuck together with natural cements
 - Water is squeezed out
 - Dissolved materials in the water left behind
 - CaCO₃, SiO₂, Fe, etc
 - These precipitates glue grains together

Types of Sediments

- 3 basic types. The names can vary...
 - o 1. **Clastic Sedimentary:** detrital particles are produced by physical weathering

- classified by grain size using common terms (gravel, sand, etc)
- certain traits of clastics are useful to determine the environment they were deposited in
 - Trait 1: Sorting
 - o Measurement of how uniform the grain size is
 - o Well sorted grains are similar in size
 - o Moderately sorted grains are some sizes mixed together
 - o Poorly sorted grains are lots of different sizes
 - Trait 2: Roundness
 - o Measures how spherical the grains are
 - o Poorly rounded grains are jagged, angular, and blocky
 - o Moderately rounded grains are somewhat spherical
 - o Well rounded grains are very spherical
 - o Longer transport = more rounded!
- Common clastic rocks
 - Formed by lithifying clastic sediments
 - Classified by the primary grain size
 - o Gravels = **conglomerate** (if gravels are moderately rounded) and **breccia** (if gravels are poorly rounded)
 - o Sand = **sandstones**
 - o Silt = **siltstone**
 - o Clay = **shale** (if layered) and **Mudstone** (if unlayered)
- o 2. **Chemical Sediments**
 - form via chemical reactions
 - dissolution and re-precipitation
 - saltwater evaporation
 - can form thick layers of chemical sedimentary rocks
 - Note: maturity factors don't apply to chemical sed. Rocks
 - They are transported as dissolved ions, so they don't get rounded, sorted, etc
 - Usually comprised of 1 major mineral type
 - ID the mineral to ID the rck
 - Halite = rock salt
 - Gypsum = rock gypsum
 - Quartz = Chert
 - These layers can be economically important deposits