4 Classes of Sedimentary Rock

- **Clastic**—loose rock fragments (clasts) cemented together.
- **Biochemical**—cemented shells of organisms.
- **Organic**—carbon-rich remains of once living organisms.
- **Chemical**—minerals that crystallize directly from water.

- Physical and chemical weathering provide the raw material for all sedimentary rocks.

Clastic Sedimentary Rocks

- Classified on the basis of texture & composition
  - Clast (grain) composition
  - Clast size
  - Angularity and sphericity
  - Sorting
  - Character of cement

Detrital (Clastic): Mostly rock fragments or mineral grains (quartz, feldspar, clay, etc.) weathered from other rocks	Mainly gravel (>2 mm)	Rounded grains	Conglomerate
		Angular grains	Breccia
	Mainly sand (1/16-2 mm)	Mostly quartz	Quartz Sandstone
		Mostly feldspar (and quartz)	Arkose
	Mainly mud (< 1/16 mm) (grains are not visible)	Mostly silt (gritty); Some grit, breaks into blocks	Siltstone
		Mostly clay (smooth); Splits into planes easily, no gritty texture	Shale

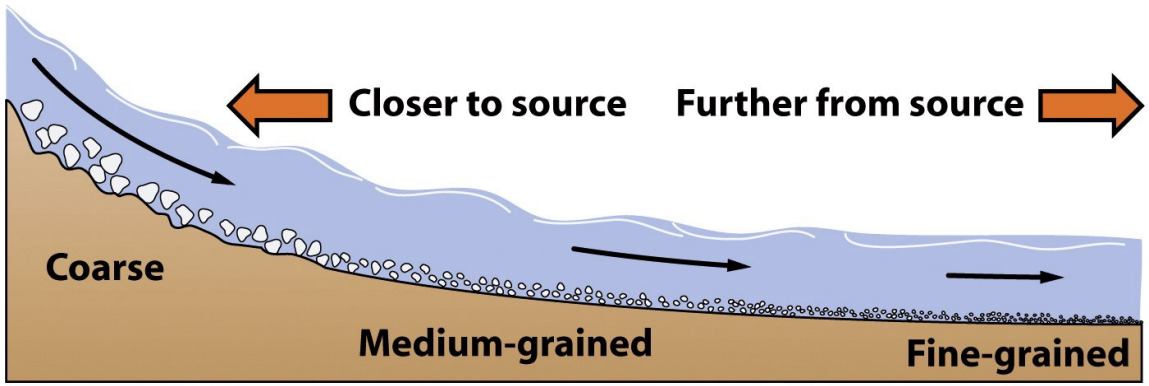
Clastic Composition

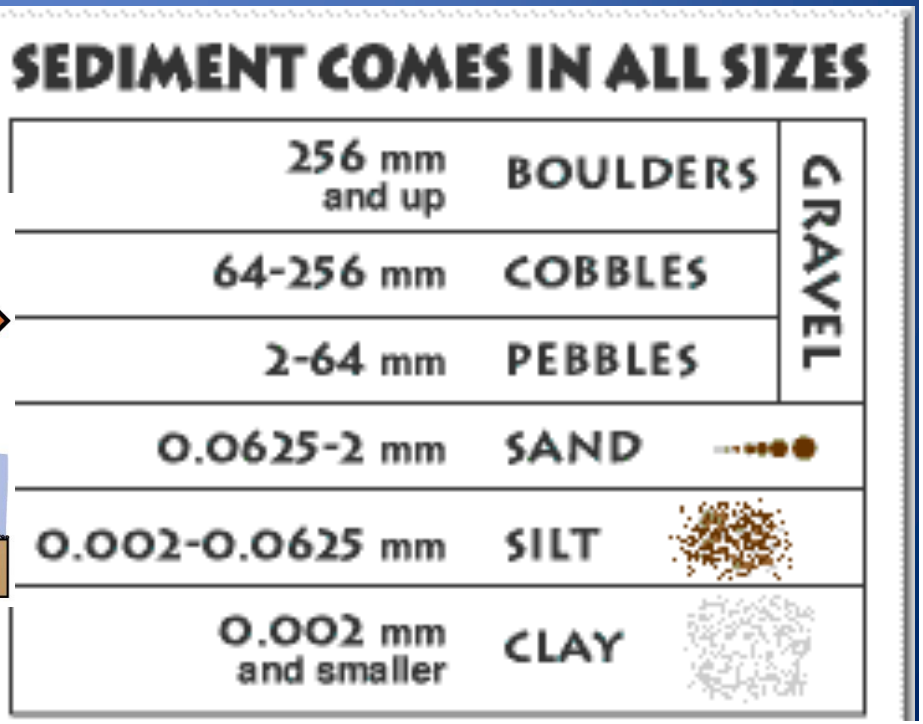
- The mineral makeup of sediments
  - May be individual minerals or rock fragments
  - Common minerals: quartz, feldspar, clay
  - **Clast identities provide clues about…**
    - The source of the sediment
    - The environment of deposition

Clastic Texture

- Clast (grain) size – The average diameter of clasts
  - Range from very coarse to very fine
  - Boulder, cobble, pebble, sand, silt, and clay
- Clast size is related to **energy**
  - High energy=large clasts
  - Low energy=small clasts
- With increasing transport, average grain size decreases

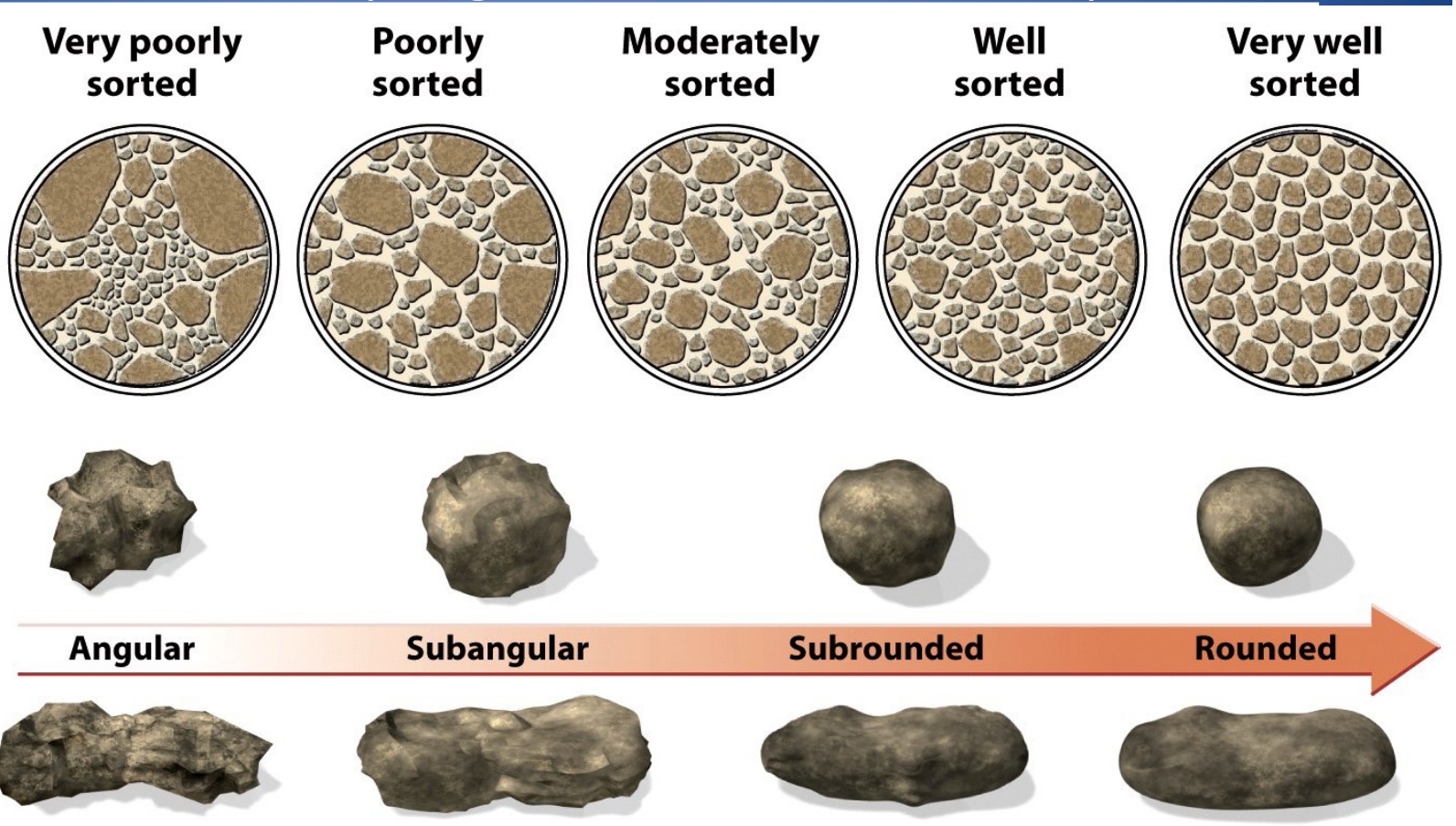
Higher current velocity **Lower current velocity**





Clastic Shape

- Angularity & sphericity (angular → rounded): indicates transport degree
  - Short transport = angular & non-spherical
  - Long transport = increased grain roundness & sphericity
- Sorting: uniformity of grain size reflects transport distance
  - Well-sorted = uniform grain sizes = longer transport distances
  - Poorly sorted = wide variety of grain sizes = shorter transport distances



Clastic Cementation

- Cement – minerals that fill sediment pores
  - Fluids with dissolved solids flush through pore system
  - Dissolved ions slowly crystallize & fill pores
- Cementation varies from weak to strong
- Common cements:
  - Quartz (*re hardness & conchoidal fracture*)
  - Calcite (*re fizzes with acid*)
  - Hematite (*re streak*)
  - Clay minerals

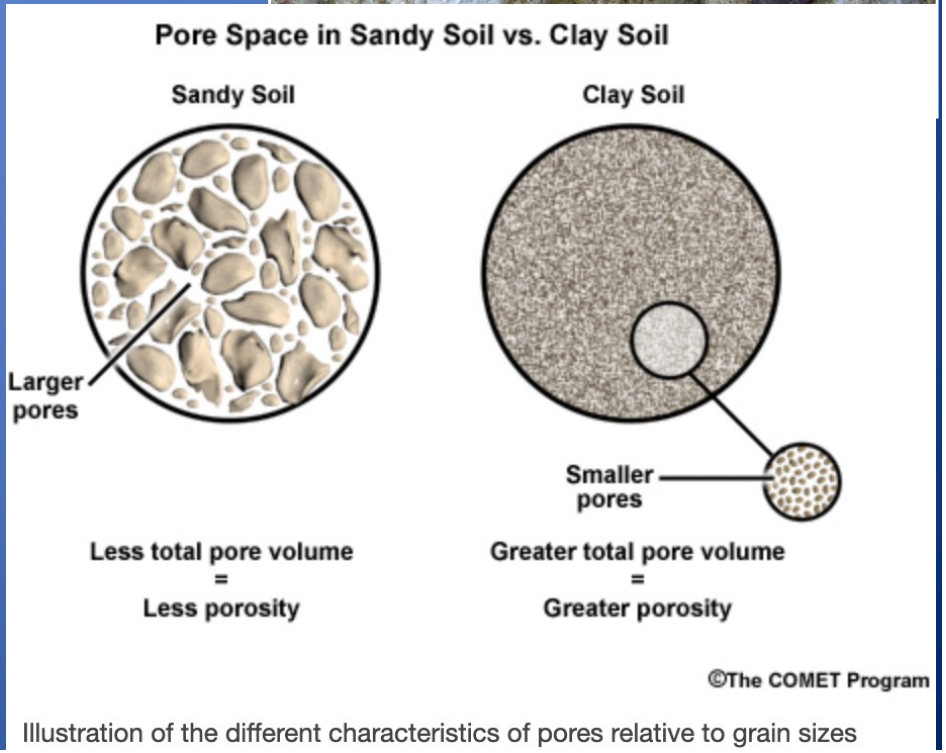
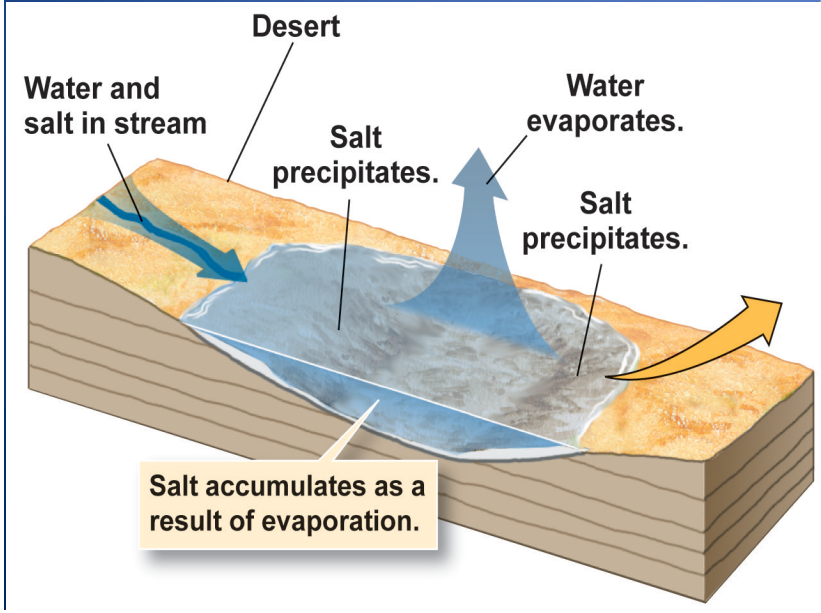


Illustration of the different characteristics of pores relative to grain sizes

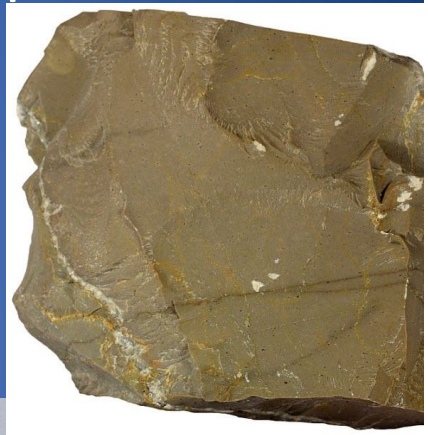
Chemical Sedimentary Rocks

- Minerals precipitated from water solution
  - Initial crystal growth in solution
  - Recrystallization during burial
- There are several classes
  - Evaporites = rock salt (halite) & rock gypsum (gypsum)
  - Travertine (calcite) & Dolostone (dolomite)
  - Replacement chert (silica)



Biochemical Sedimentary Rocks

- Sediments derived from the skeletons of living organisms accumulating after death
- Chert: made of Silica (SiO_2) = skeletons of some marine plankton
- Limestone: made of Calcite & Aragonite ($CaCO_3$)
  - Fossiliferous limestone—contains visible fossil shells
  - Chalk—made up of plankton shells (invisible)
  - Coquina—made almost entirely of shell fragments
  - Micrite —calcium carbonate mud



Organic Sedimentary Rocks

- Made of organic carbon, the soft tissues of living things
  - Peat —barely altered remains of fossil vegetation forms in bogs
  - Coal—altered/carbonized remains of buried fossil vegetation
    - Black, combustible sedimentary rock
    - Over 50–90% carbon
    - Fuels industry since the industrial revolution began