Sediments and Sedimentary Rocks

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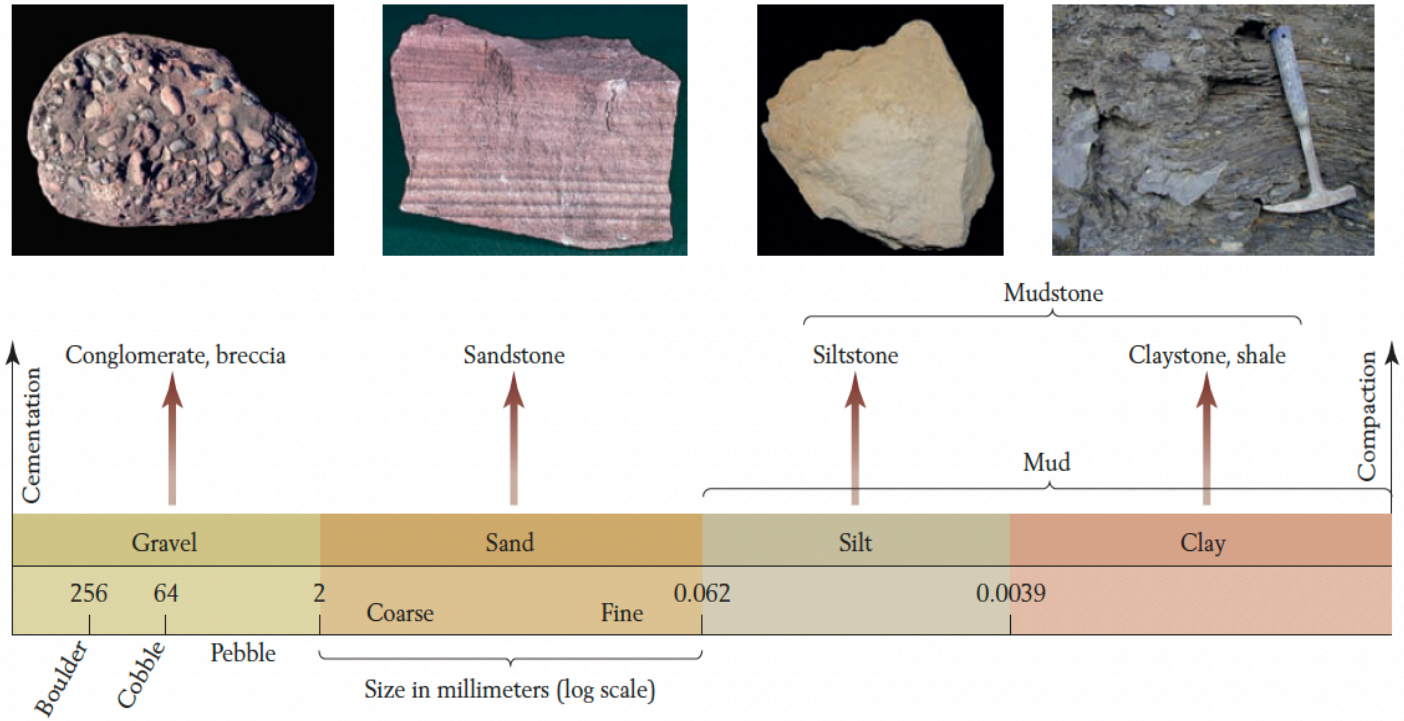
Transportation of Sediments

Size of Sediments

Scale of grain size: Φ

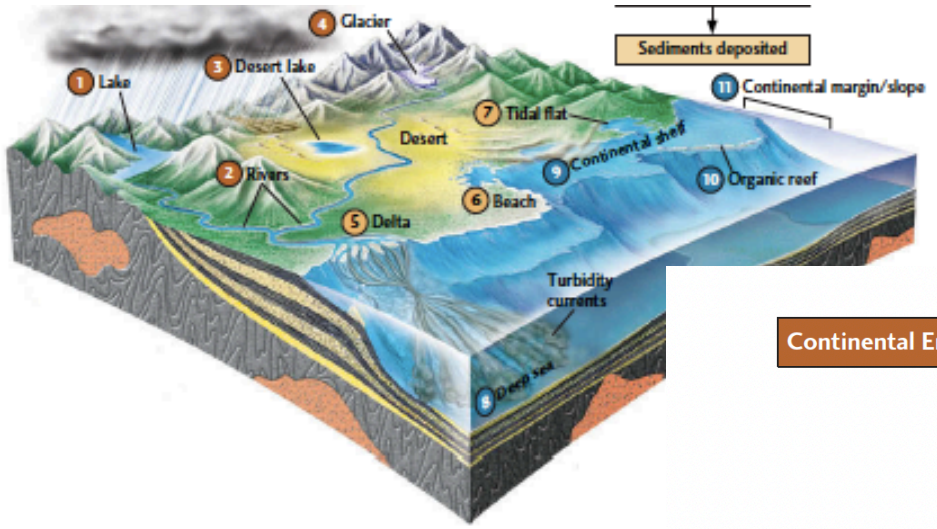
$\phi = -\log_2$ (grain size in mm)



Particle Size	Sediment	Rock
Coarse-Grained	**Gravel**	
Larger than 256 mm	Boulder	
256–64 mm	Cobble	Conglomerate
64–2 mm	Pebble	
Medium-Grained		
2–0.062 mm	Sand	Sandstone
Fine-Grained	**Mud**	
0.062–0.0039 mm	Silt	Siltstone
		Mudstone (blocky fracture)
Finer than 0.0039 mm	Clay	Shale (breaks along bedding)
		Claystone

Deposition of Sediments

Depositional Environments



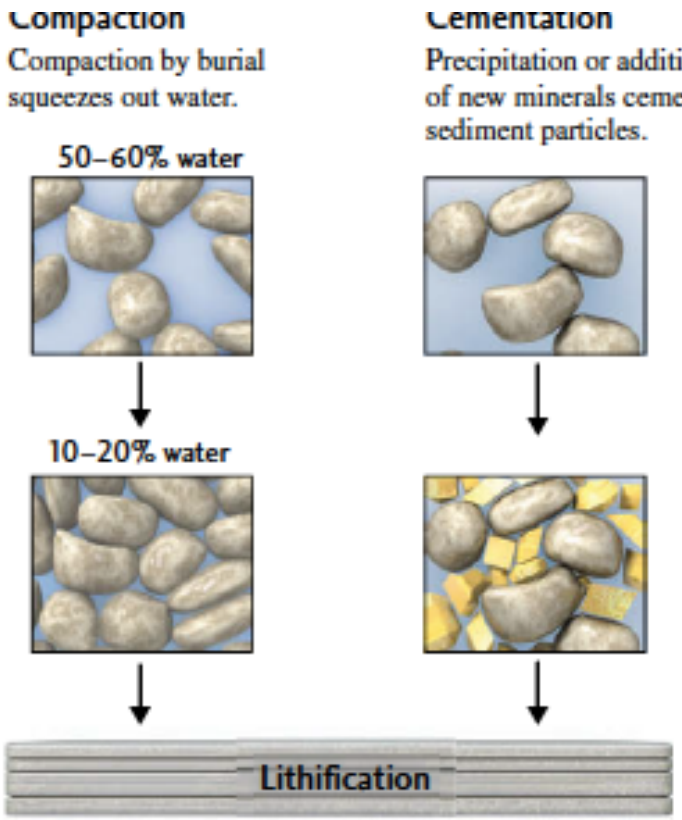
	1	2	3	4
Continental Environments	**Lake**	**Alluvial**	**Desert**	**Glacial**
Transport agent	Lake currents, waves	River currents	Wind	Ice, meltwater
Sediments	Sand and mud, saline precipitates in arid climates	Sand, mud, and gravel	Sand and dust	Sand, mud, and gravel
Climate	Arid to humid	Arid to humid	Arid	Cold
Biological processes	Freshwater organisms and precipitates	Organic matter in muddy flood deposits and wetlands	Little biological activity	Little biological activity

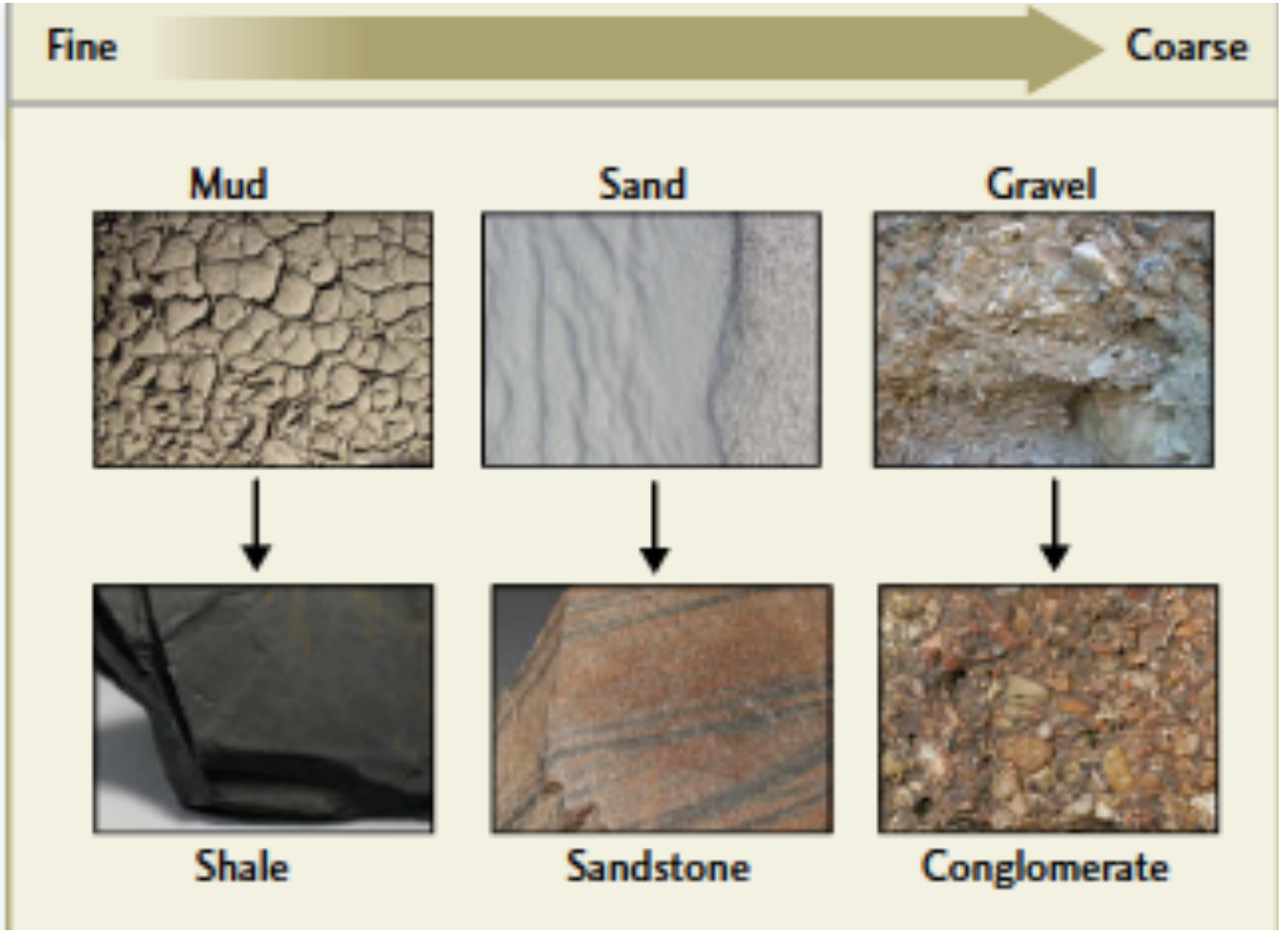
	5	6	7
Shoreline Environments	**Delta**	**Beach**	**Tidal flats**
Transport agent	River currents, waves	Waves, tidal currents	Tidal currents
Sediments	Sand and mud	Sand and gravel	Sand and mud
Climate	Arid to humid	Arid to humid	Arid to humid
Biological processes	Burial of plant debris	Little biological activity	Organisms mix sediments

	8	9	10	11
Marine Environments	**Deep sea**	**Continental shelf**	**Organic reefs**	**Continental margin/slope**
Transport agent	Ocean currents Turbidity currents	Waves and tides	Waves and tides	Ocean currents and waves
Sediments	Mud and sand	Sand and mud	Calcified organisms	Mud and sand
Biological processes	Deposition of remains of organisms	Deposition of remains of organisms	Secretion of carbonates by corals and other organisms	Deposition of remains of organisms

Book pages 124-125

Sediments to Sedimentary Rocks





Types of Sediments

Based on origin, sediments can be classified into three types:

Inorganic
- Clastic or detrital
- Chemical (may involve biological processes) – Limestone, Chert, Evaporites,

Organic -
- Biological – coquina, coral

Clastic or detrital: weathering of preexisting rocks forms clastic particles that are transported and deposited.

Chemical: weathering produces dissolved ions and molecules that form chemical sediments.

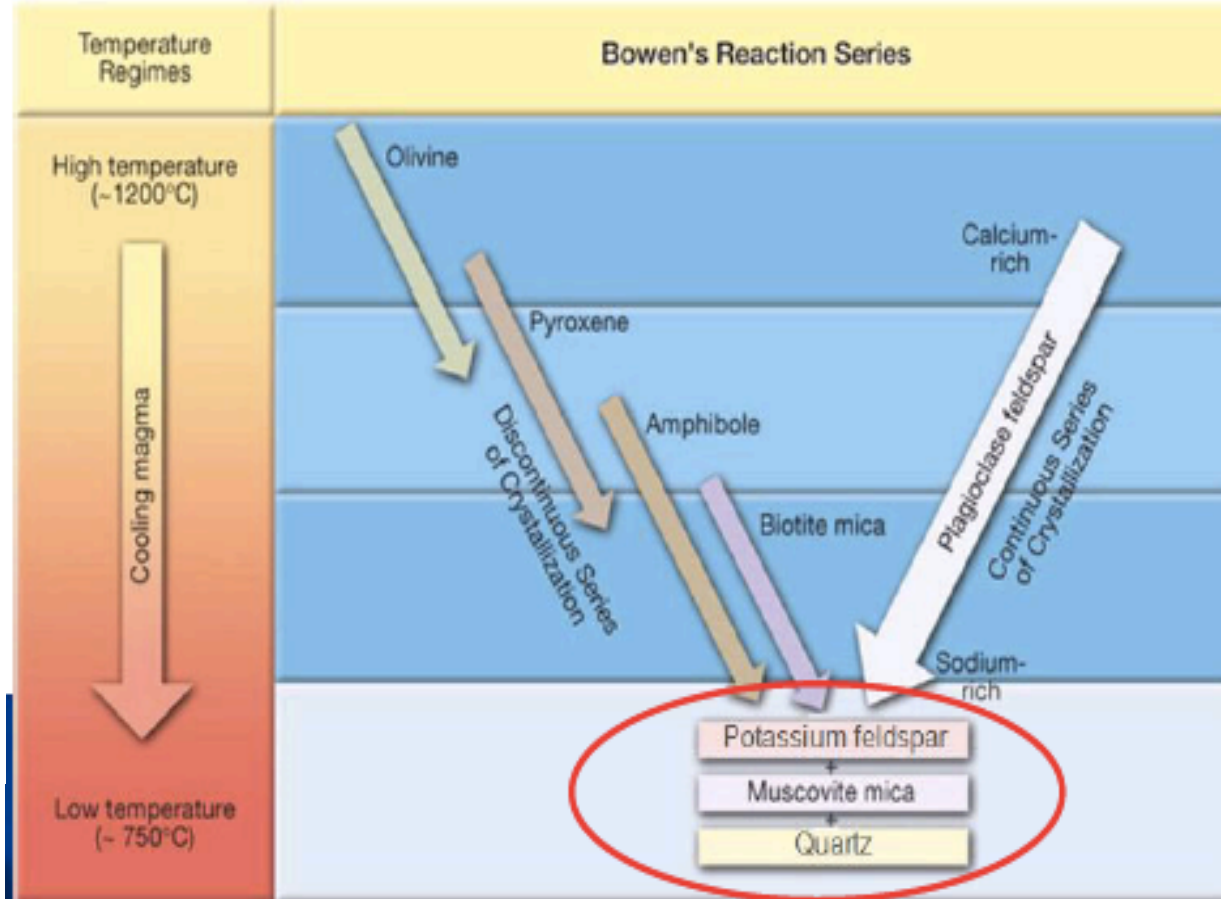
Transportation of Sediments

Composition of Sediments

Composition:

what are the minerals

Intensity of Weathering		
Low	Medium	High
Quartz	Quartz	Quartz
Feldspar	Feldspar	Clay minerals
Mica	Mica	
Pyroxene	Clay minerals	
Amphibole		



History of weathering and erosion?

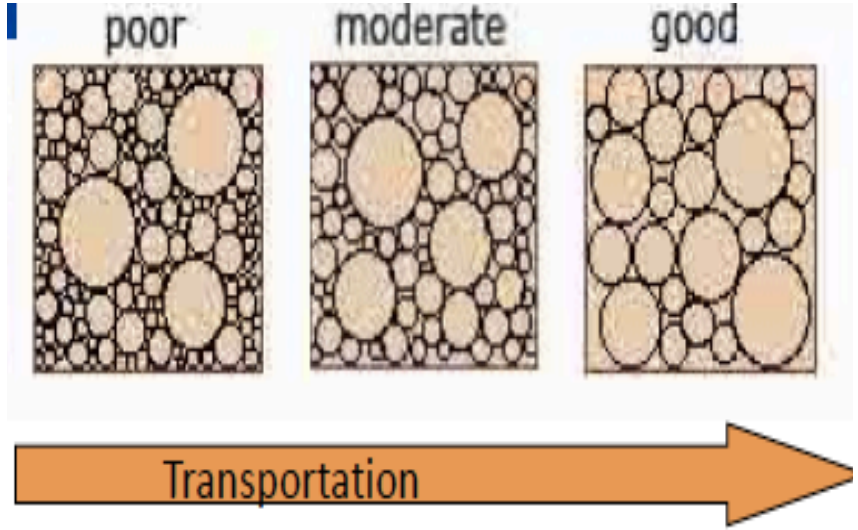
Minerals that form at high P/T are not stable at Earth surface where sedimentary processes are ongoing [Bowne Series]

Transportation of sediments

Sorting of Sediments

Particle sorting:

what is the relative size of particles



Rapid deposition could result in poor sorting

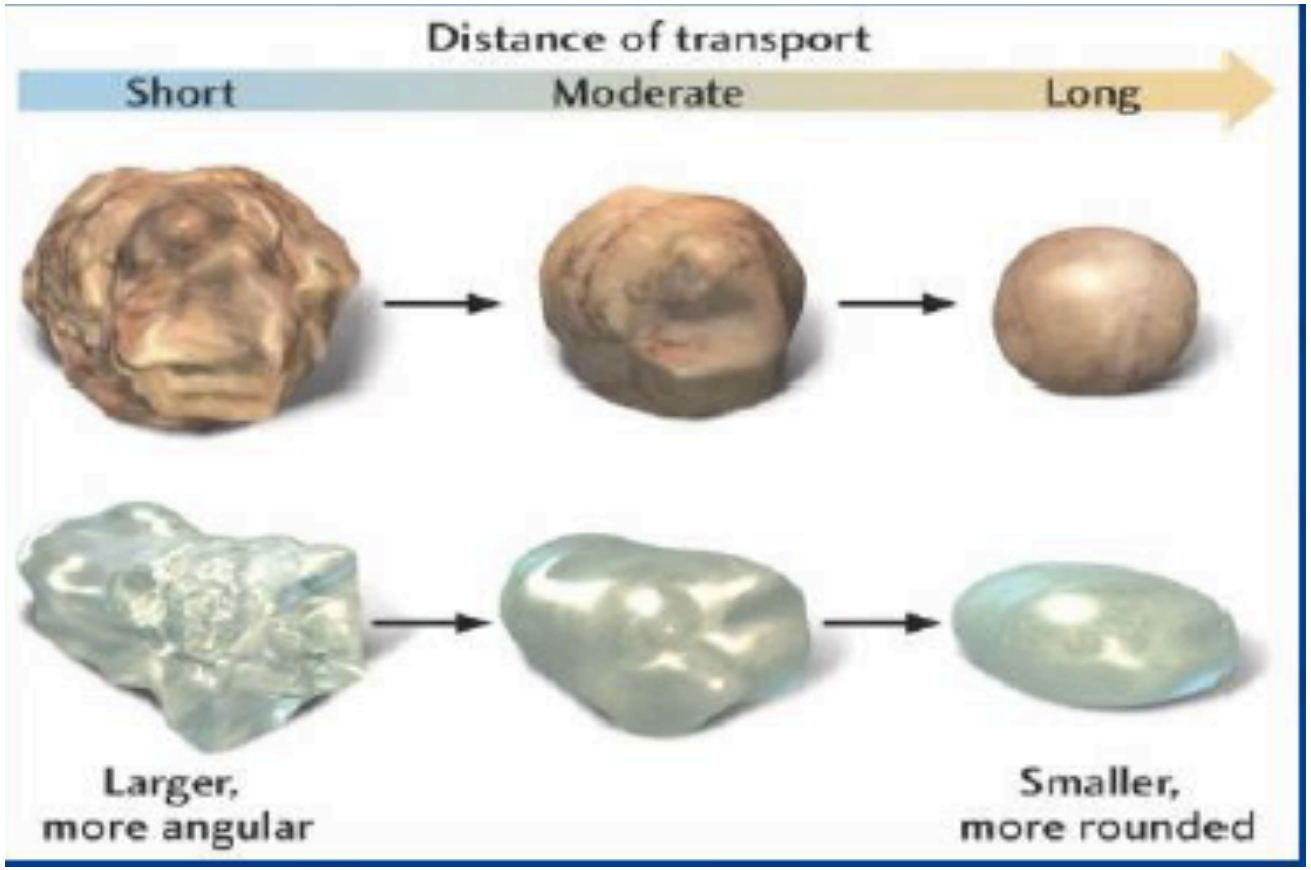
A

B

FIGURE 2-18 **Sediment sorting.** The photos show (A) poorly sorted and (B) well-sorted sand grains. (A, Rory Buckland RF/ Alamy; B, AfriPics.com/Alamy.)

Transportation of sediments

Shape: Rounding



History of weathering and erosion?