INTRODUCTION TO EARTH SCIENCE
Sedimentary Rock Classification

Dr. Gregg Wilkerson and Jack Pierce

Sedimentary rocks are made from other rocks, either from the **detritus** (bits and pieces) or from solutions of dissolved material. Consider what happens if you leave a rock outside for a long time (the processes involved in breaking rocks down are called **weathering**). The minerals begin to break down and loosen and eventually the rock begins to fall apart. If we then take those pieces and stuck them back together we would have a sedimentary rock. Some of the minerals will dissolve and be carried away as a solution. The mineral constituents can come back out of the water through a chemical reaction (think calcite) or through evaporation (think halite). These minerals are also part of a sedimentary rock.

Just like igneous and metamorphic, sedimentary are part of the Rock Cycle. Sedimentary rocks can be made from any type of rock, including earlier-formed sedimentary rocks. The process to make sedimentary rock is called **diagenesis** which usually involves two processes; **compaction** and **cementation**. Just by making a pile of rocks the mineral grains are compacted together, in some cases enough to make a rock. Usually there are also fluids circulating between the grains and the fluids generally carry $CaCO_3$ (calcite), SiO_2 (silica), or FeO_2 (iron oxide) which cement the grains together like glue.

Just like with igneous, and as we will learn shortly, metamorphic, sedimentary rocks are classified by texture (the size and arrangement of mineral grains), and composition. For this lab we will consider three textures to define sedimentary rocks, **inorganic clastic** or **detrital** (bits and pieces), **chemical** (from dissolved rocks), and **organic clastic** or **bio-clastic** (bits and pieces of critters or plants).

The clastic rocks are classified based on grain size. If the grains are mostly sand-sized (between 1/16 and 2 mm) we call the rock **sandstone**. If the grains are mostly silt-sized (between 1/256 and 1/16 mm) we call the rock a **siltstone**. We can be more specific by referring to the composition of the grains such as quartz sandstone, but that is not needed for this class. Just remember, in clastic sedimentary rocks - size matters.

We classify the chemical sedimentary rocks based on what they are made of. For example, those rocks made of CaCO3 are called limestones and we can generally differentiate a little further such as crystalline limestone, or fossiliferous limestone.

The organic clastic rocks (bio-clastic) are named based on what is in them. Chalk is microscopic snail shells, and peat is identifiable pieces of plant material.

All rocks can tell us something about Earth's history, and sedimentary rocks tell us about the history of the Earth's surface. If we want to know what the area around Hart Park looked like 15 million years ago we can learn that from the sedimentary rocks in the area. This is because the rocks leave clues about where they were deposited, and if we can read the clues in a stack of rocks we know what was there at that time. The clues come from certain rocks being deposited in certain areas. For example, a sandstone with certain features tells of a sand dune, and another tell us of a beach, or a river channel. We know the features present in these areas or **depositional environments** from studying the modern versions. If we went out to the Kern River bottom and studied the way the sand and gravel are arranged we would recognize those same features from an ancient river preserved as rock (in the bluffs below BC for example). There is a list of the various depositional environments and associated rock types with the rock descriptions.

Some other concepts you can observe in sedimentary rocks can help to determine the depositional environment. **Sorting** is a measure of the variation in grain sizes, and rocks where all the grains are nearly the same size are called well sorted. Most rocks have a variety of grain sizes and these are called poorly sorted. Consider conglomerate or breccia for example, they have larger clasts in a finer groundmass and are poorly sorted. Sorting is accomplished in nature but winnowing, the process of removing finer grains. An example of this is in sand dunes which can be very well sorted.

Another concept is **angularity** and **roundness** which are related to transport distance. A conglomerate clast is rounded, suggesting that it was rolled down a river bed for some distance before deposition. Breccia clasts are angular suggesting minimal transport, and in fact breccia can be indicative of deposition along a fault that broke up the rocks.

DEPOSITIONAL ENVIRONMENTS

SEDIMENTARY ENVIRONMENT	**ROCK TYPE**
CONTINENTAL	
Desert	Sandstone, Breccia
Alluvial Fan	Sandstone, Breccia, Conglomerate
River (Fluvial)	Sandstone, Conglomerate
River Flood Plain	Sandstone, Siltstone, Shale
Lake (Lacustrine)	Siltstone, Shale, Chert
Swamp	Peat, Lignite, Bituminous Coal
Cave	Travertine
Spring	Travertine, Tufa
TRANISTION	
Littoral (between high and low tide)	Sandstone, Coquina, Conglomerate
Deltaic	Conglomerate, Sandstone, Siltstone, Shale

MARINE

Continental Shelf (low tide to shelf)	Sandstone, Siltstone, Shale, Limestone
Continental Slope	Shale, Chalk, Limestone, Chert
Abyssal (deep ocean basin)	Shale, Diatomite, Chert

SEDIMENTARY ROCKS WORKSHEET: TEAM

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Sample	Texture/Type	Textural Features	Composition and Diagnostic Features	Depositional Environment	Rock Name
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

13					
14					

SEDIMENTARY ROCKS EXAM: NAME ____

Sample	Texture/Type	Textural Features	Composition and Diagnostic Features	Depositional Environment	Rock Name
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					