

**Primary features of rocks**  
**EPSC 240, Geology in the Field**  
Sept 5, 2018

**Key concepts for Week 1:**

*Uniformitarianism:* The principle that processes operating in the natural world today are the same as those which operated in the past. Therefore, if we observe limestone on Mount Royal, we can examine the environments on earth where limestone is forming today, and conclude that the environmental conditions which are required to form limestone must have been in place in Montréal in the Ordovician period.

*Principle of Superposition:* This is a logical argument used to deduce the relative age of different rocks.

First, if the rocks are laid down on the earth's surface, it follows that the rock layers (or beds) below are the oldest, and the rock layers above are the youngest. Thus, if you find old rocks on top of young rocks, you may assume that deformation has occurred.

*Principle of cross-cutting relationships:* The principle that a geologic feature which cuts another is younger than the one it cuts. Examples include: igneous intrusions (which must be younger than the rock they intruded into, sometimes called country rock), unconformities, where a younger sediment is deposited on an erosional surface cutting into an older rock.

*Sedimentary rocks:* Rocks which are deposited at the earth's surface, by the action of water, wind or ice (along with gravity). Sediments (sand, silt, clay, mud, talus, till, etc) erode from solid rock, are found nearly everywhere on the surface and are transported (usually downslope). Faster flowing water or wind can carry larger, heavier particles, and the particles evolve in shape and size as they move through the environment. Therefore, sediments preserve a detailed record of the environment in which they were deposited. There are two main divisions of sedimentary rocks:

- *Clastic (aka sediments):* Made from fragments of other rocks and minerals. Examples include sandstone, shale, mudstone, siltstone, conglomerate, sedimentary breccia.
- *Chemical:* Precipitated from water. Examples include salt, limestone, chert.

These two divisions are not necessarily exclusive - flowing water carries particles (clasts) and also has dissolved minerals in it. For example, it is common to find limestones containing clay particles (as we will see on Mount Royal).

*Horizontality and lateral continuity:* Although not always true, it is a useful axiom to treat all sedimentary rocks (and some igneous rocks as well, such as lava flows deposited on the earth's surface) as being originally horizontal and planar. So, layers of rocks can be thought of as infinite sheets lying parallel to the earth's surface. This is a reasonable approximation in areas where the landscape is relatively flat, and the environmental conditions are similar over very broad areas.

*Primary features:* When a rock is deposited, the primary features are the characteristics it has at the time of deposition, such as grain size and shape, characteristics of the bedding such as grain sorting, cross bedding, etc. These features are used to identify the rock.

*Secondary features:* Characteristics of the rock which developed after deposition. Examples include: weathering (which causes changes in colour and texture), folding, faulting, metamorphism, or development of cleavage ... anything which changes the appearance or structure of the rock after it has formed.

Most rocks' appearance is controlled by a combination of primary and secondary features.