# Rock identification and stories lab

Identify each of the 11 rocks, and write down the story that it tells. Use the description below, or any of the geology lab books available, to help you.

## Sedimentary Rocks:

### Sandstone:

characteristics: Sandstone is made of sand-sized particles, often quartz and feldspar, that are cemented together. If you look at the particles with a handlens, or even with the naked eye, you can see individual grains often somewhat rounded because sharp edges were knocked off during transport down stream, along beaches, etc. Sand-sized particles range from just big enough to see to about 2mm in diameter.

Story: Sandstones formed in moderate-energy environments where working of wind or water swept away smaller particles and deposited sand-sized particles. particularly well-sorted sandstones may represent beaches where wave action washed the sand particularly clean before it was lithified into rock.

### Shale:

characteristics: Shale is made of silt and clay-sized particles that are too small to see individually. Often, scraping with a knife will reveal a fine powder. Shale is made of a variety of minerals, including quartz, mica, and clay minerals. The clay minerals typically give shale a grey color. If there is a lot of organic matter in the shale (such as from leaves or bits of sea creatures that accumulated with the sediment), it will take on a black color. Sometimes shale tends to break into flattish chunks or thin sheets. This property is called fissility.

Story: Shale formed in a low energy environment where water or wind was sufficiently still to allow the very tiny particles to settle out and accumulate. Environments with low energy include lagoons, swamps, marshes, out in the deep part of lakes, and far enough offshore in oceans where the waves don't affect it much.

### Limestone:

Limestone is made of $CaCO_3$, which reacts with dilute HCl acid. Thus, a key test for limestone is to place a drop of acid on it, and, if it fizzes, it's probably limestone. Sometimes you can use vinegar for this test if HCl is not available, since vinegar is also acidic. Limestone is usually a biochemical rock, that is creatures or plants extracted Ca, C, and O from water and formed it into solid $CaCO_3$. Therefore, fossils are common in limestone. Things that make $CaCO_3$ include most sea shells (molluscs, brachiopods), corals (in the phylum cnidaria), several varieties of algae, sponges (phylum porifera), bryozoa, and echinoderms. Limestone is most commonly a white or grey color, but it can take on other colors, such as pink, black, green, due to impurities in the rock.

Story: Limestone typically precipitates either chemically or biochemically from water, most often marine water (salt water), or hypersaline water (really salty water). It is most common far enough offshore so that sand and silt aren't washed into the area and the water is clear. $CaCO_3$

dissolves more easily in cold water, which is often more acidic than warm water, therefore limestone forms in greater abundance in water marine water (but is not limited to those areas).

**Gypsum:**
Characteristics: Rock gypsum is composed mainly of the single mineral, gypsum. Gypsum is very soft (softer than a fingernail and so can be scratched by a fingernail). It's color is typically clear or white, but can take on color from impurities, such as pink or yellow. It will not effervesce (fizz) in dilute HCl acid.

Story: Gypsum crystallizes from sea water when it's concentration in the sea water becomes sufficiently high, such as due to evaporation. Therefore, it is often indicative of a restricted arid marine environment (that is, ocean water that is in an area with little rainfall and has limited exchange with the open ocean, such as a narrow bay or lagoon along a shoreline.

**Igneous Rocks:**

**Granite:**
characteristics: Granite is a coarse-grained (phaneritic) rock made of minerals of orthoclase feldspar (often pinkish, squarish minerals with nice cleavage planes), plagioclase feldspar (often whitish, squarish mineral with nice cleavage planes), quartz (often clear or gray mineral with conchoidal fracture), and either biotite or amphibole (both are black minerals).

Story: Coarse particle size indicates slow cooling at depth in the Earth's crust (say, a few miles deep). It is not volcanic.

**Basalt:**
characteristics: Basalt is a fine-grained (aphanitic) rock made of minerals of plagioclase feldspar, olivine, and pyroxene. Because of the small crystal size, individual minerals cannot be identified, however the composition and mix of minerals usually make it dark colored. Broken surfaces do not break like glass. Vesicles (bubbles formed from gas in the magma) are common.

Story: Small crystal size indicates rapid cooling at the Earth's surface. It is volcanic.

**Rhyolite:**
characteristics: Rhyolite is an extrusive igneous rock with a very high silica content. It is usually pink or gray in color with grains so small that they are difficult to observe without a hand lens.

Story: Small crystal size indicates rapid cooling at the Earth's surface. It is volcanic.

**Obsidian:**
characteristics: Obsidian is a glass, meaning that it has no minerals or crystal structure. Presence of iron in the glass makes it very dark colored (usually black) regardless of its composition. It breaks with a conchoidal fracture, often with sharp edges. People once used it to make knives and scrapers that were harder and sharper than steel.

Story: The absence of minerals indicates very rapid cooling at the Earth's surface, perhaps even in water in some cases.

**Metamorphic Rocks:**

**Slate:**
characteristics: Slate is a gray or black rock, particles too small to see individually with the naked eye. It has slaty cleavage, which is the tendency of the rock to break into flat sheets along a smooth surface. Often the surface will look slightly shiny. The slaty cleavage (which is completely different from mineral cleavage) and the shininess are the result of mica and clay crystals in the rock becoming oriented by pressure.

Story: The slaty cleavage and orientation of mineral grains indicate that the rock has been metamorphosed, heated under pressure. It probably formed at depth in the earth, such as under a range of mountains. It formed at a lesser depth however than schist or gneiss.

**Quartzite:**
characteristics: Quartzite is a non-foliated metamorphic rock composed almost entirely of quartz. It forms when a quartz-rich sandstone is altered by the heat, pressure, and chemical activity of metamorphism. These conditions recrystallize the sand grains and the silica cement that binds them together. The result is a network of interlocking quartz grains of incredible strength. Quartzite is usually white to gray in color. Some rock units that are stained by iron can be pink, red, or purple. Other impurities can cause quartzite to be yellow, orange, brown, green, or blue.

Story: Most quartzite forms during mountain-building events at convergent plate boundaries. There, sandstone is metamorphosed into quartzite while deeply buried. Compressional forces at the plate boundary fold and fault the rocks and thicken the crust into a mountain range. Quartzite is an important rock type in folded mountain ranges throughout the world.

**Gneiss:**
characteristics: Gneiss has banding, alternating layers of light colored and dark colored minerals. The light colored bands will usually look white or pink, the dark bands black. The bands are not the same thing as layers in a sedimentary rock, but rather formed due to heat and pressure. Sometimes the gneiss may be shiny due to orientation of mica crystals. Individual crystals are big enough to see.

Story: The banding and orientation of mineral grains indicate that the rock has been metamorphosed, heated under pressure. It probably formed at depth in the earth, such as under a range of mountains. It usually formed at a depth greater than slate or schist.

| | color | texture (fine, medium or coarse-grain) | Foliated Or Banded | Rock Group (Sedimentary, Metamorphic, Igneous) | Rock Name |
|---|---|---|---|---|---|
| R1 | | | | | |
| R8 | | | | | |
| R10 | | | | | |
| R12 | | | | | |
| R13 | | | | | |
| R5 | | | | | |
| R2 | | | | | |
| R4 | | | | | |
| R7 | | | | | |
| R6 | | | | | |
| #11 won't stick | | | | | |
| R9 | | | | | |
| Mystery Object | | | | | |

# Analysis and Conclusion Questions:

1. Explain how intrusive igneous rock is formed.

2. Explain how extrusive igneous rock is formed.

3. Name processes by which sedimentary rocks are formed.

- Step One:_____
- Step Two:_____
- Step Three:_____
- Step Four:_____

4. What type of rock forms from the evaporation and precipitation of dissolved minerals?

5. Describe which sample is not a rock and why you think this object is not a rock. How did you determine that the sample was not a rock?

6. What do you think the “mystery rock” is? Explain your answer: