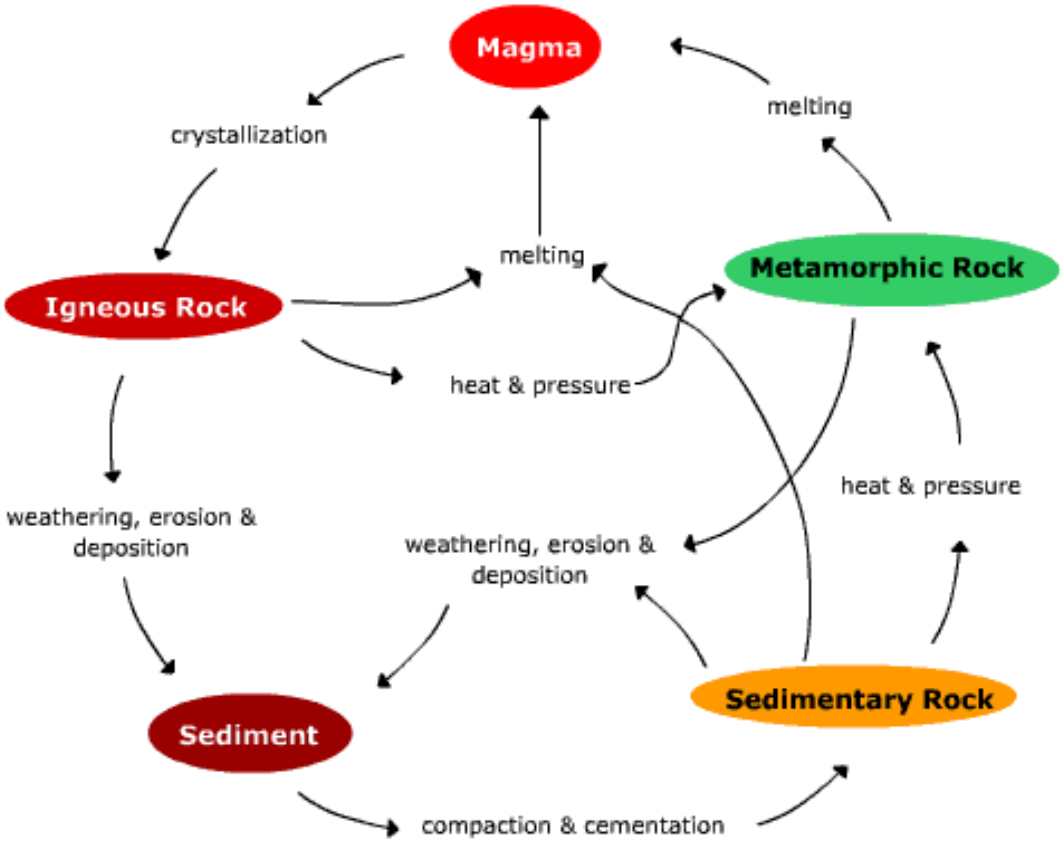
The Rock Cycle



Rock Cycle

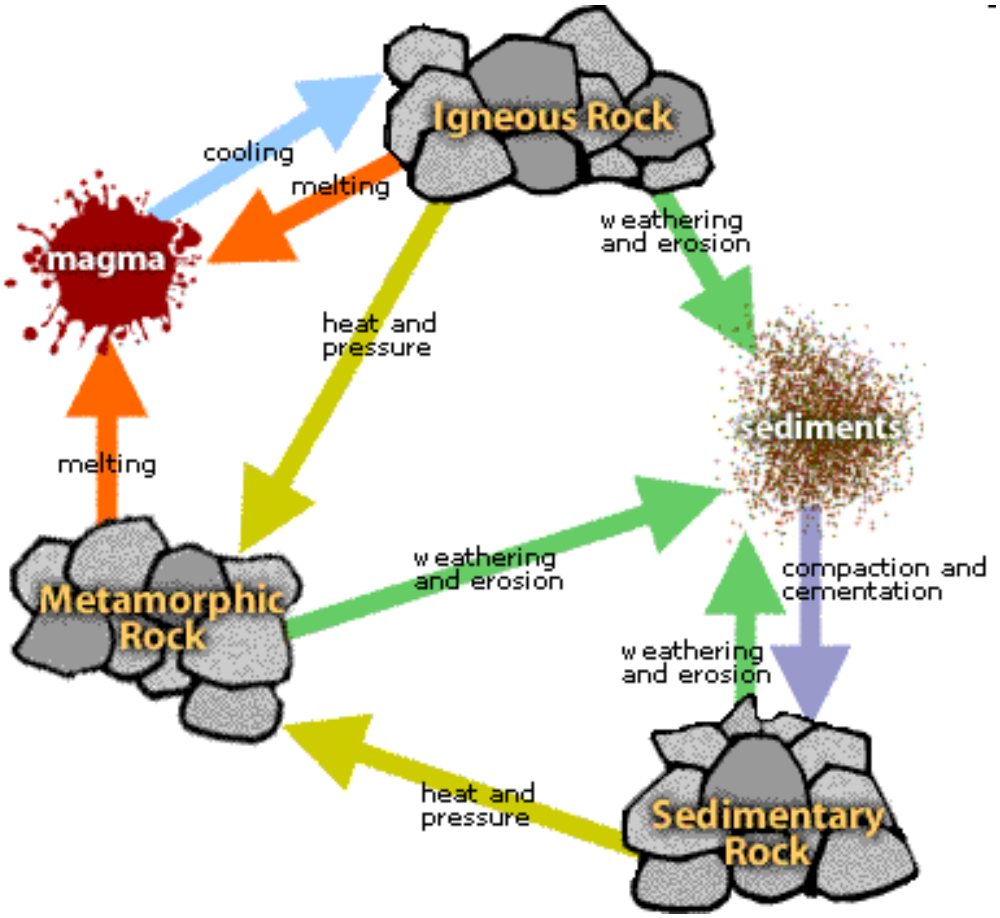
Rocks don't form into the three types of rocks and stay there. The Earth is constantly changing and in motion. The rock cycle demonstrates how a rock can start out as one type and change into another.

Classifications of Rocks

- Three types of rocks:
- (1) igneous
- (2) sedimentary
- (3) metamorphic

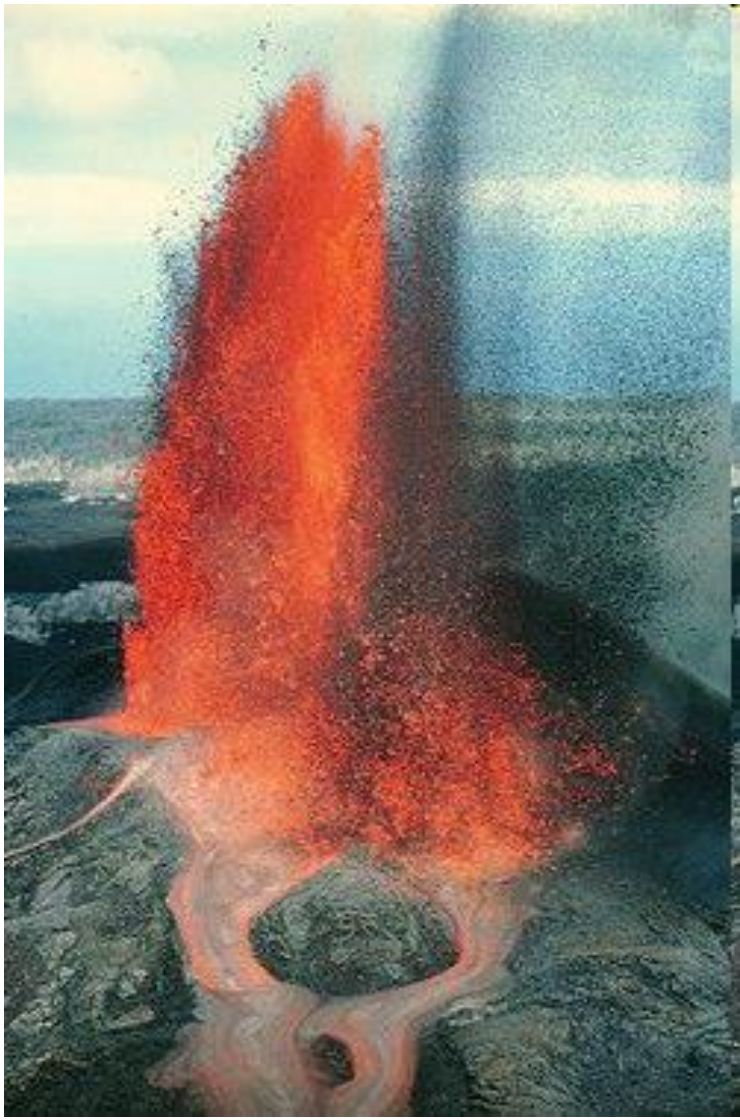
The Rock Cycle

- Interactions among Earth's water, air, land and living things can cause rocks to change from one type to another.
- The continuous processes that cause rocks to change make up the rock cycle
- Changes in rock occur over long periods of time



Igneous Rocks

- **Magma** is molten rock located deep beneath Earth's surface
- When magma cools and hardens beneath the Earth's surface or above the surface (due to volcanic eruption) *igneous rock* forms
- Magma that reaches the surface is called **lava**



Formation of Igneous Rocks

- Rocks that form when magma hardens under the Earth's surface are called *intrusive* igneous rocks
- Since magma is less dense than surrounding rocks, it slowly moves towards the surface. As it rises, it cools allowing elements to combine and form large crystals and coarse grains easily seen

Granite is an example of an intrusive igneous rock

Formation of Igneous Rocks

- When magma reaches the surface, it is called lava. Lava is similar to magma, except in lava most of the gases have escaped. When lava cools quickly and hardens, it forms smaller crystals that make up fine grained rock called *extrusive* igneous rocks.

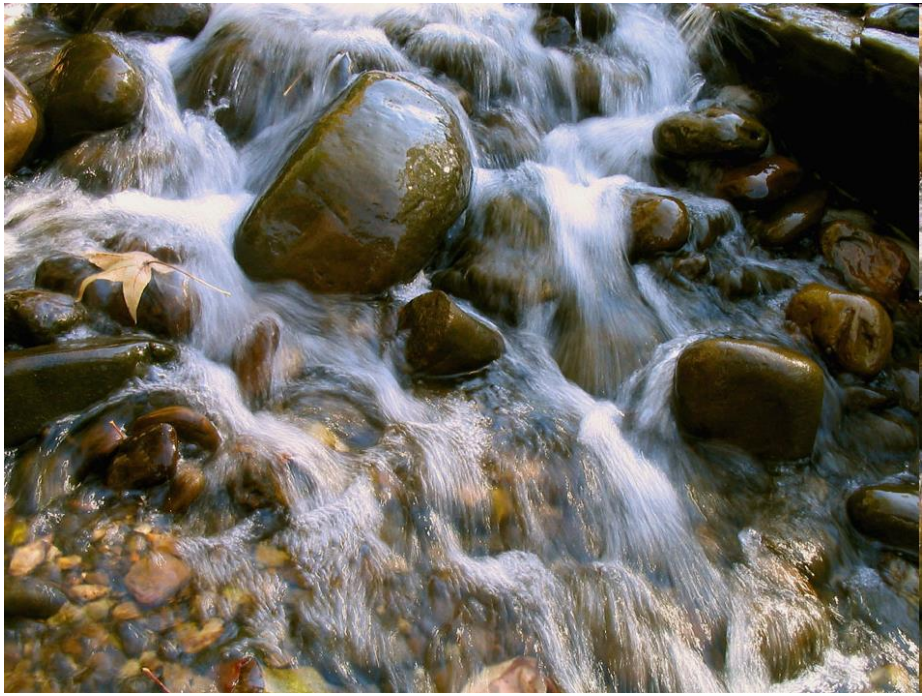
Rhyolite is an example of an extrusive igneous rock.

Sedimentary Rocks – Weathering

- Any rock at Earth's surface will undergo weathering
- Weathering is a process in which rocks are physically and chemically broken down by water, air, and living things
- The weathered pieces of earth material are called sediments

Sedimentary Rocks- Erosion

- Sediments are moved and eroded by **water, wind, gravity, or glaciers**
- Eventually, the sediments are compacted and cemented together to form sedimentary rocks



Agents of Erosion

- There are four main agents of erosion: wind, water, glaciers, and gravity
- Each agent creates different landscapes

Wind Erosion

Dunes of Mo'omomi, HI

Sand Dunes

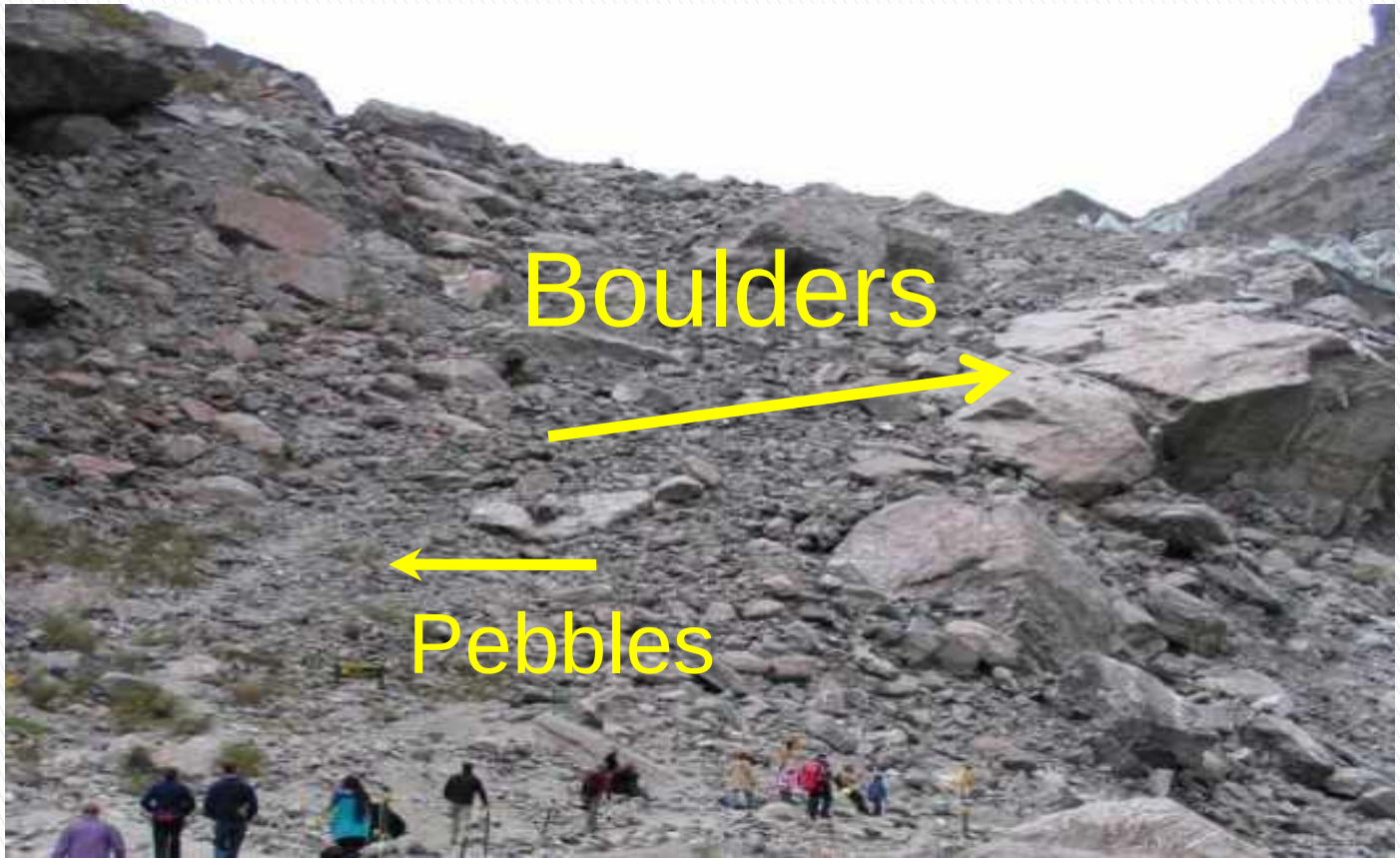
Wave Erosion

- If waves erode a cliff from two sides, the erosion produced can form an **arch.**

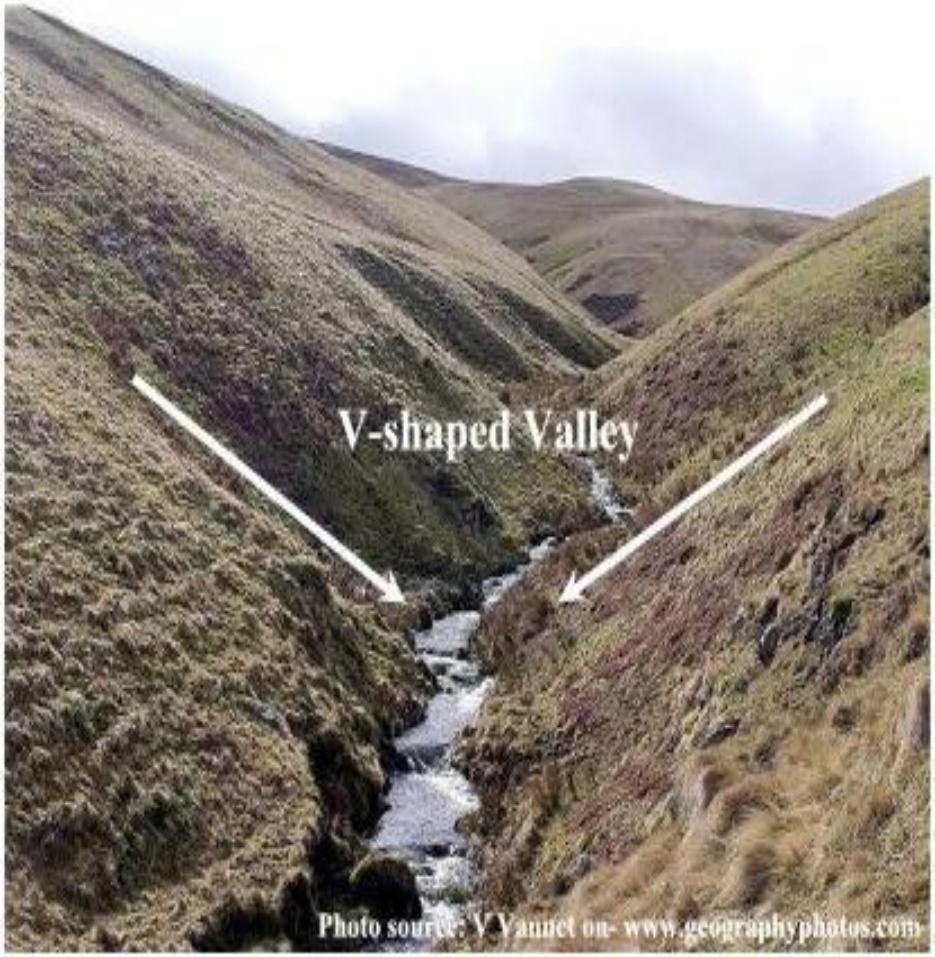
Glacial Erosion

- They form U-shaped valleys, parallel scratches, and grooves in the bedrock. Rock becomes polished.

- Glacier sediments are **Unsorted**
- The mass of snow picks up sediment of any size and shape and moves the sediment to another location (**erosion and deposition**).
- **Example:** Like rolling a large snow ball to make a snowman, the snow ball picks up rocks, dirt, and grass.



Gravity Erosion



Sedimentary Rocks – Deposition

- When an agent of erosion loses energy, it drops the sediments in a process called *deposition*
- Largest sediments are dropped first, followed next by smaller sediments like sand
- Some sediments are so small they are carried great distances before being dropped

Sedimentary Rocks – Burial

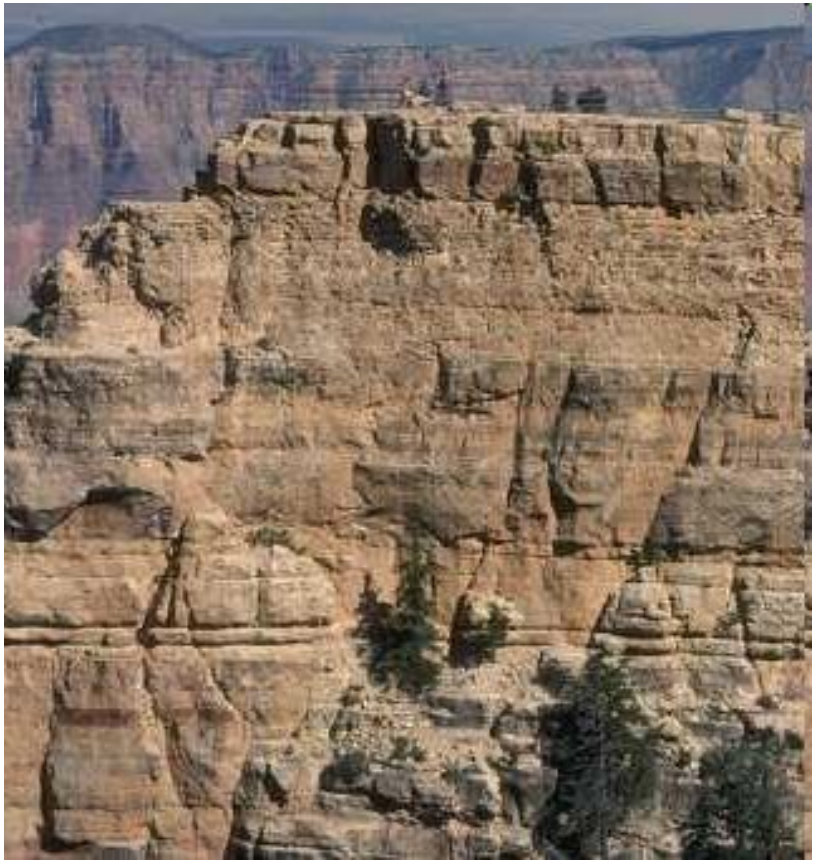
- As sediments are dropped, they bury other sediments
- This creates a bedding effect over time similar to what you see at the Grand Canyon

Sedimentary – Lithification

- **Compaction** and **cementation** change sediments into sedimentary rock
- *Compaction* = squeezes sediments
- ***Lithification*** = caused by the weight of sediments
- ***Cementation*** = dissolved minerals are deposited in the tiny spaces among the sediments

Features of Some Sedimentary Rocks

- Many unique features of sedimentary rocks are clues to how, when, and where the rocks formed
- In undisturbed sedimentary rocks, the **oldest layers are found at the bottom**
- Youngest layers found at the top

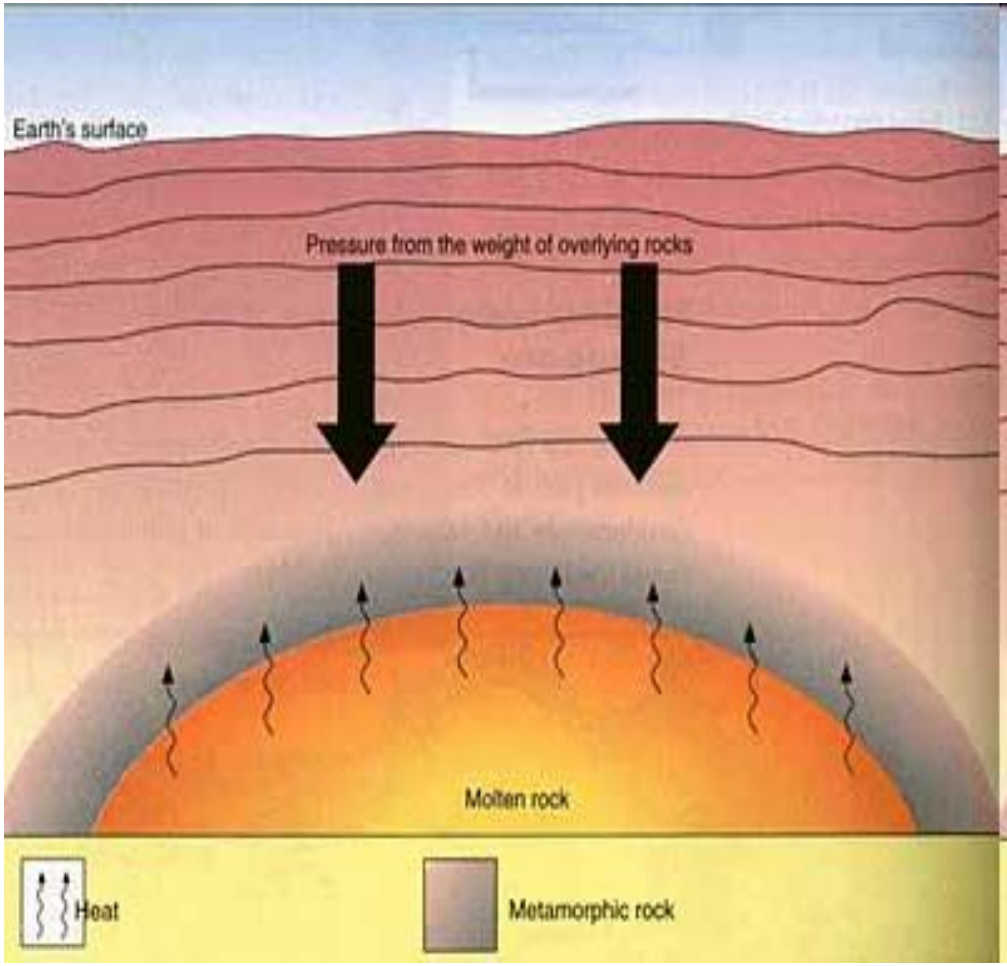


Features of Some Sedimentary Rocks

- Provide clues about the climate over time
- Mud cracks and ripple marks can indicate dry periods as well as formations along beaches or streams
- Record of fossils present

Metamorphic Rocks

- If sedimentary rocks are buried deep underneath the Earth's surface, they will be exposed to high pressure and heat
- With extreme pressure and heat conditions, sedimentary rock will change into metamorphic rock



Heat

- Most important agent for metamorphism
- Heat provides energy required for chemical reactions to occur
- Heat comes from two sources:
- (1) magma
- (2) change in temperature with depth (temperature increases 20° -30° C/km

Pressure (Stress)

- Pressure increases with depth
- Increases in temperature and pressure cause rock to flow rather than fracture
- Under these conditions, mineral grains will flatten and elongate

Classification of Metamorphic Rocks

- Metamorphic rocks are classified according texture and composition
- Two types of texture:
- (1) foliated
- (2) nonfoliated

Foliated Metamorphic Rock

- A *foliated rock* is a metamorphic rock with a texture that gives the rock a layered (banded) appearance
- EX: Gneiss, schist

Gneiss

Schist

Nonfoliated Metamorphic Rock

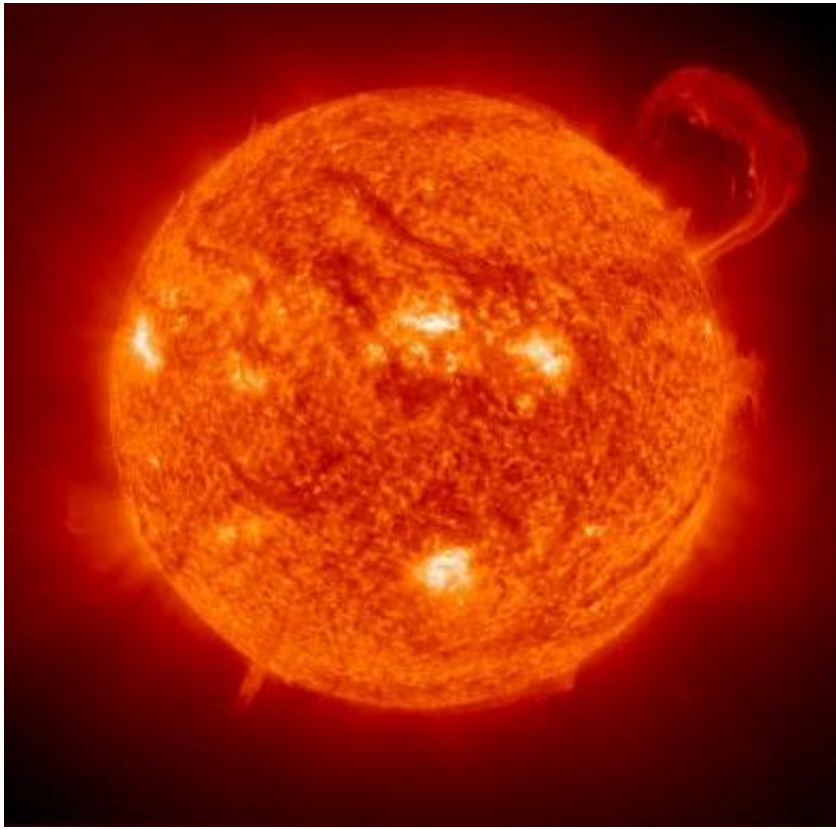
- A metamorphic rock that does not have a banded texture is called a *nonfoliated metamorphic rock*
- Contain only one mineral
- EX: Marble

Marble

Anthracite Coal

Source of Energy for Rock Cycle

- Processes driven by heat from Earth's interior are responsible for the formation of both igneous and metamorphic rocks.
- Weathering and movement of sediments are driven by energy from the Sun.
- Gravitational Potential Energy drives motion of erosion



Rock Cycle Review!

- Animation Review