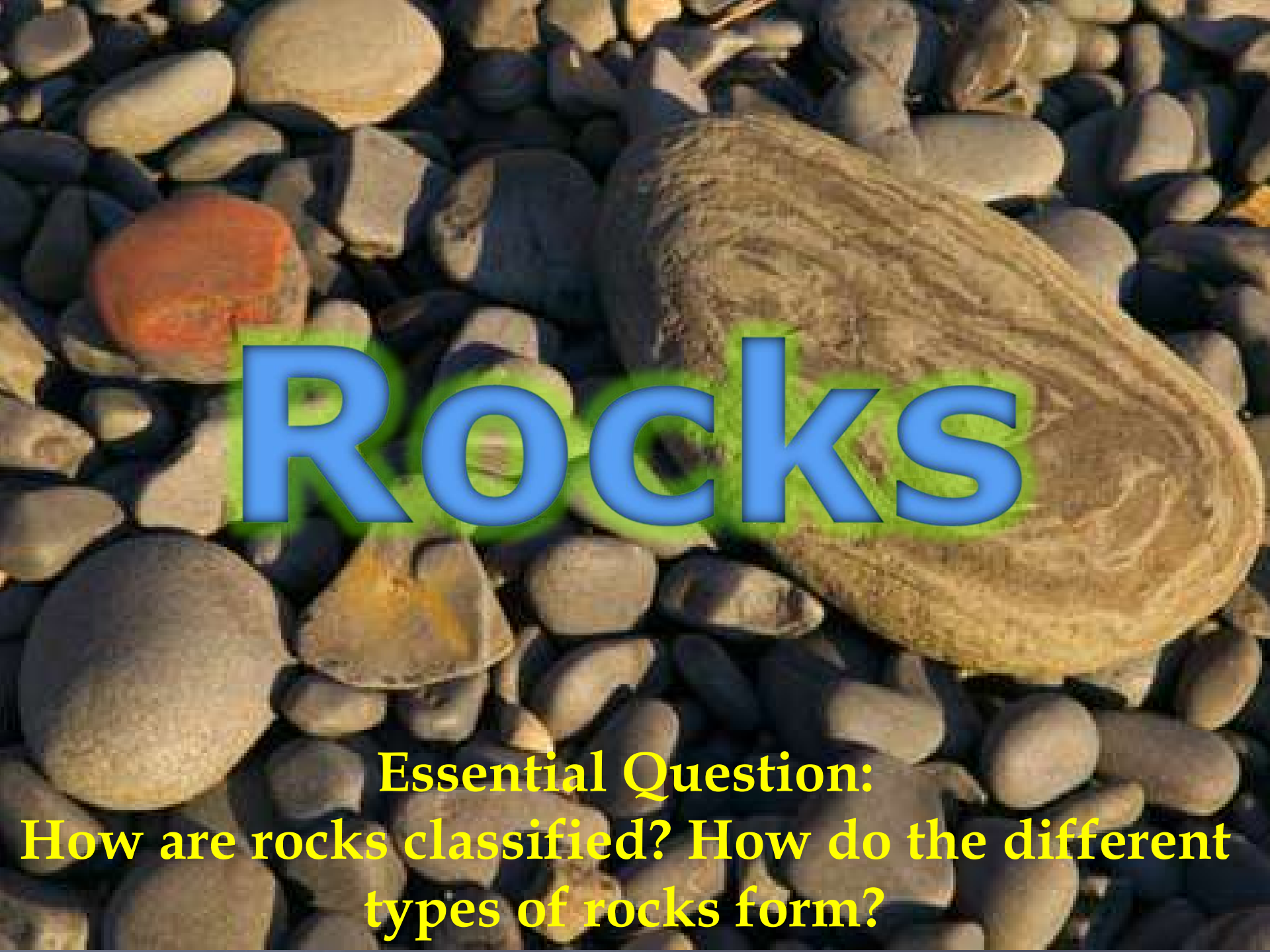




Rocks

Essential Question:

How are rocks classified? How do the different types of rocks form?

What is a Rock?

- ▣ Rocks are made of mixtures of minerals and other materials.
- ▣ Some rocks contain one mineral, some contain several different minerals
- ▣ About 20 minerals make up most of the Earth's crust; these minerals are known as rock-forming minerals



How do we identify the type of rock?

- ▣ Geologists identify rocks by looking at their color, texture, and mineral composition to classify a rock
 - **Color-** a rock's color can tell how the rock was formed, but color alone doesn't provide enough information to identify the rock
 - **Mineral Composition-** geologists study the shape and color of crystals in a rock to help identify minerals that are in the rock; we can use the same tests on rocks that we use on minerals (example: chemical reaction test)
 - **Texture-** geologists use texture, how the rock looks and feels, to help identify the rock; some rocks are smooth and glassy others are rough

We identify rocks by their **COLOR**



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We identify rocks by their **MINERALS**

Feldspar Feldspar minerals make up about half the Earth's crust, and they are the main component of most rocks on the Earth's surface. They contain the elements silicon and oxygen along with aluminum, potassium, sodium, and calcium.

Biotite Mica Mica minerals are shiny and soft, and they separate easily into sheets when they break. Biotite is but one of several varieties of mica.

Quartz Quartz (silicon dioxide, SiO_2) is the basic building block of many rocks. If you look closely at the piece of granite, you can see the quartz crystals.

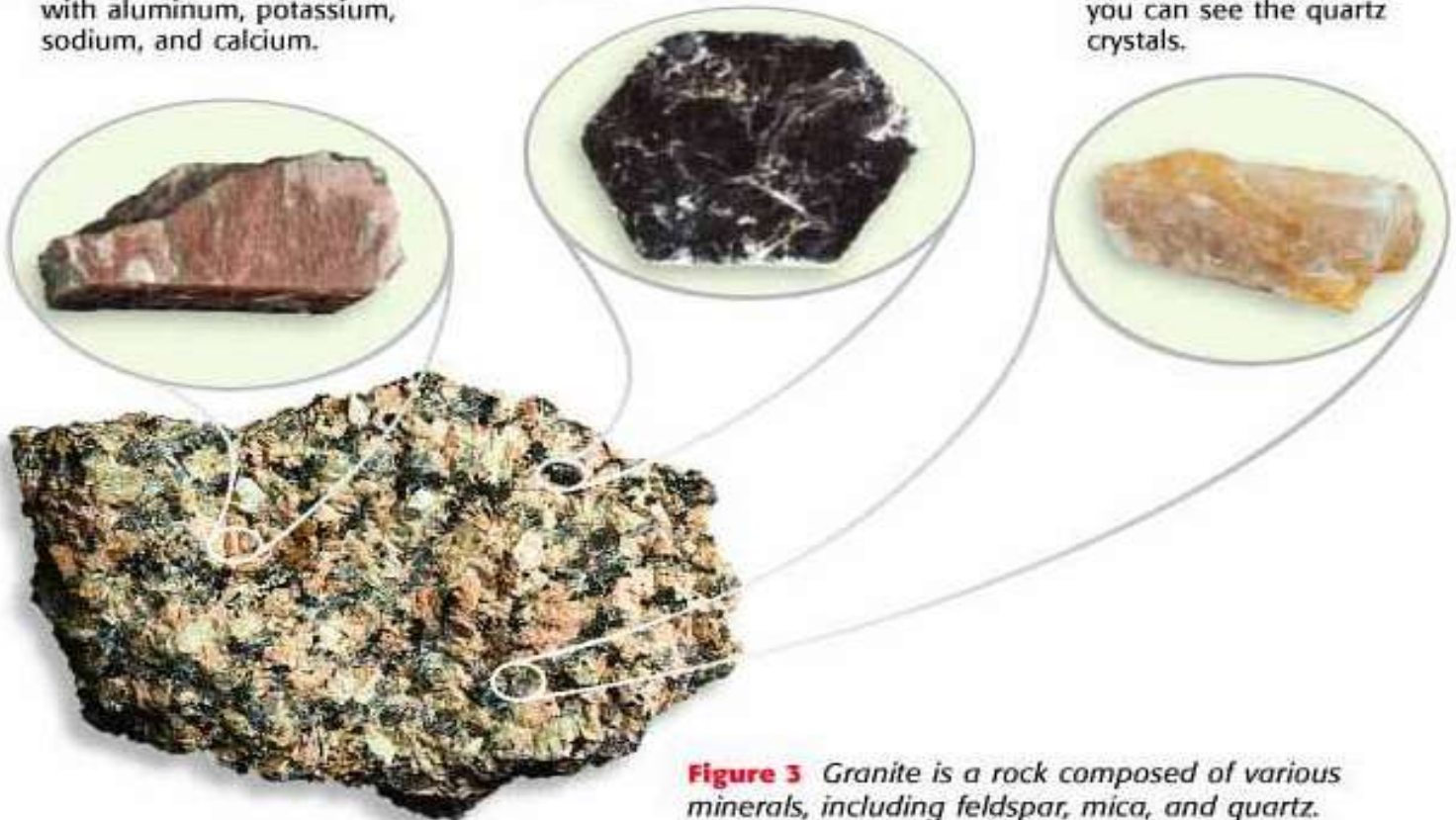


Figure 3 Granite is a rock composed of various minerals, including feldspar, mica, and quartz.

We identify rocks by their **TEXTURE**

Grain Pattern: Banded vs. Non-Banded



Grain Size: Fine Grain vs. Large Grains



Grain Shape: Rounded Grain vs. Jagged Grains



What are the 3 rock types?

▣ Geologists classify (organize) rocks into 3 groups based on how they were formed:

- ▣ **IGNEOUS**
- ▣ **SEDIMENTARY**
- ▣ **METAMORPHIC**

Igneous Rocks

▣ “Ignis” = Latin for “fire”



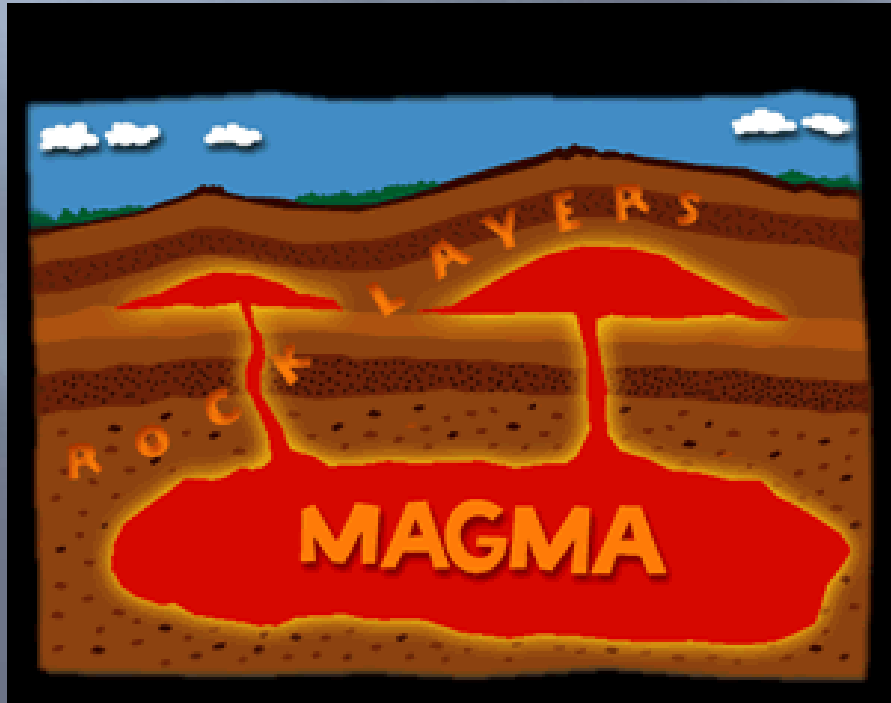
▣ Formed from the cooling of either magma
or lava

▣ The most abundant type of rock

▣ 2 Types of Igneous Rocks: Intrusive or
Extrusive

Intrusive Igneous Rocks:

- ▣ **Below ground** = from magma (intrusive igneous rock)
 - ▣ Usually have LARGE crystal grains (they cooled slowly)



Extrusive Igneous Rocks:

- ▣ **Above ground** = from lava (extrusive igneous rock)
 - ▣ Usually have SMALL or NO crystals (they cooled too quickly)



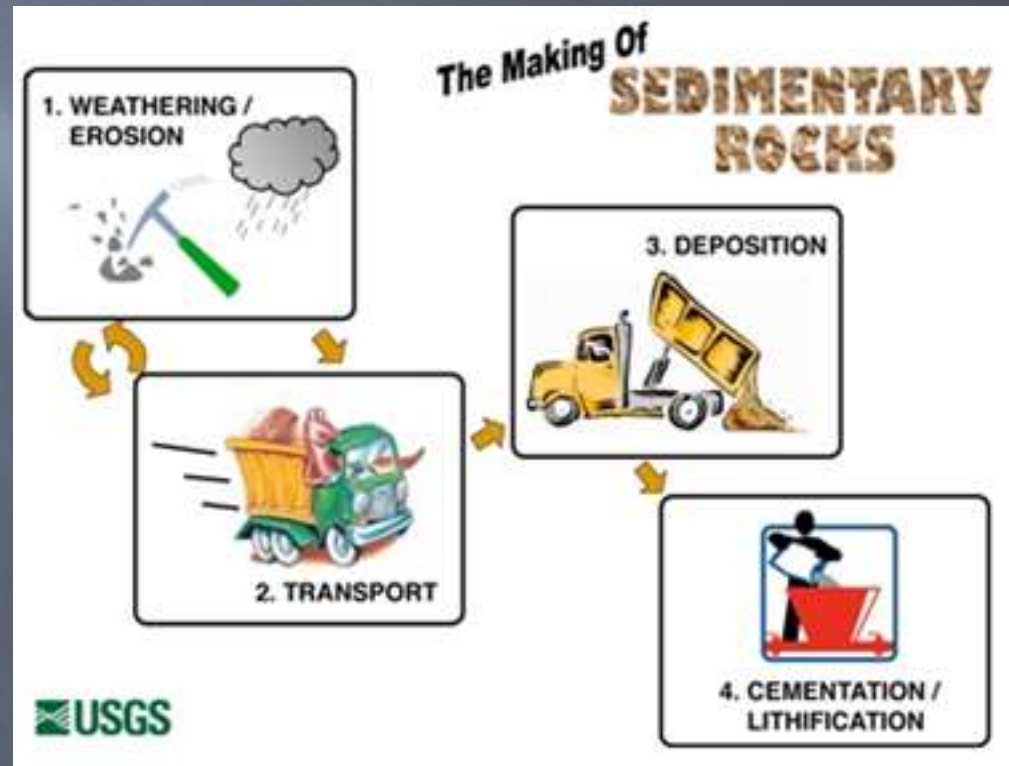
Sedimentary Rocks

- ▣ Formed from sediments (rock fragments, mineral grains, animal & plant remains) that are pressed or cemented together



Sedimentary Rocks

- Sedimentary Rocks are formed through a series of processes: weathering, erosion, deposition, compaction, cementation. (WEDCC)



WEDCC:

▣ Weathering

- The breaking down of rock by wind and water

▣ Erosion

- Running water, wind, loose ice carry away fragments of rock

▣ Deposition

- The “dropping” off of sediment

▣ Compaction

- Process where sediments are pressed together

▣ Cementation

- Process which minerals crystalize and “glue” sediments together

▣ The Grand Canyon is a great example of a large sedimentary rock!



▣ Sedimentary rocks may also contain fossils!



How can sedimentary layers help us understand the age of fossils?

- As sedimentary rocks are deposited, they form horizontal layers
- Scientists know that the layers on top (and the fossils in the top layer) are YOUNGER than the fossils in lower layers.



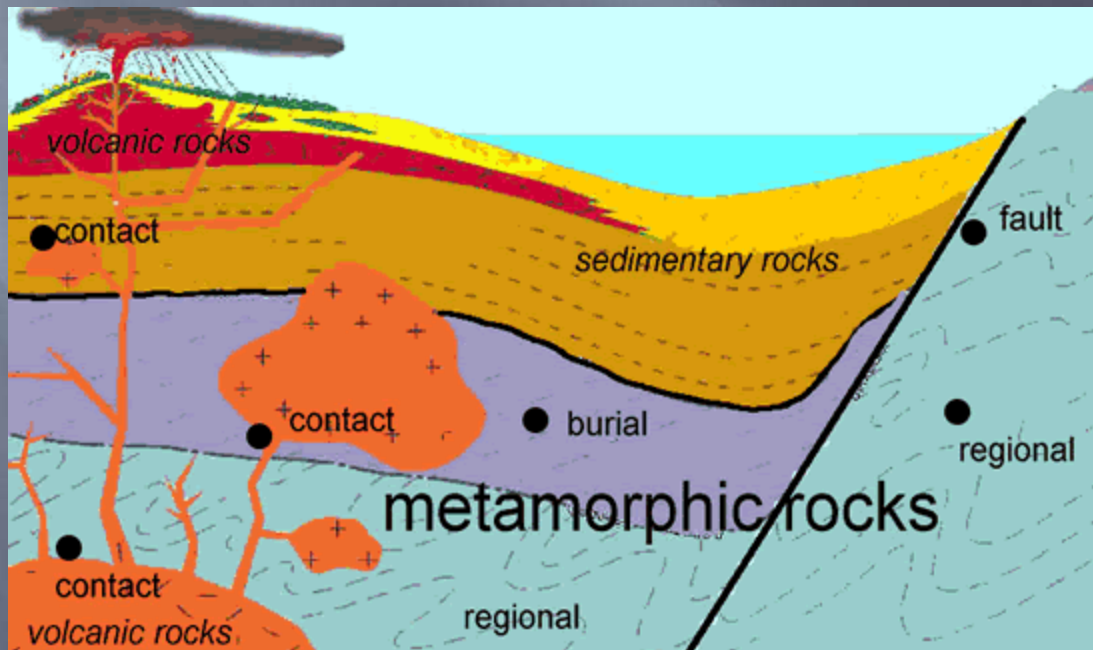
Metamorphic Rocks

- ▣ Rocks that have changed due to intense temperature and pressure
- ▣ “Meta” means “change” and morphosis means “form” in Greek
- ▣ Igneous, sedimentary and other metamorphic rocks can change to become metamorphic rocks



What occurs in the Earth to change these rocks?

- **Pressure** from overlying rock layers
- High heat, but not enough to melt the rock
- Rocks may be flattened or bent or atoms may be exchanged to form new minerals.



How are metamorphic rocks classified?

- ▣ Foliated—mineral grains are flattened and line up in parallel bands
- ▣ *Example:* gneiss formed from rearrangement of minerals in granite into bands



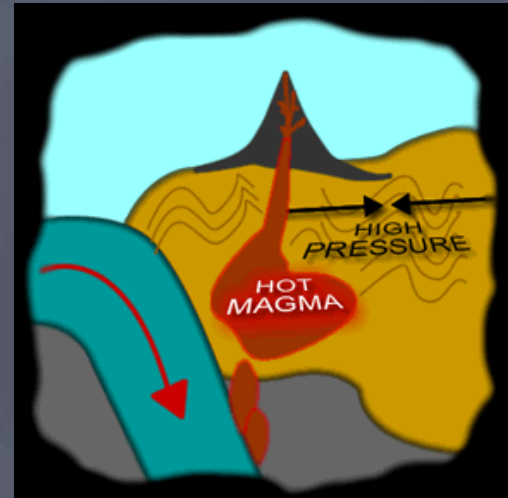
How are metamorphic rocks classified?

- ▣ Non-Foliated—No bands are formed
 - *Example:* marble formed from limestone



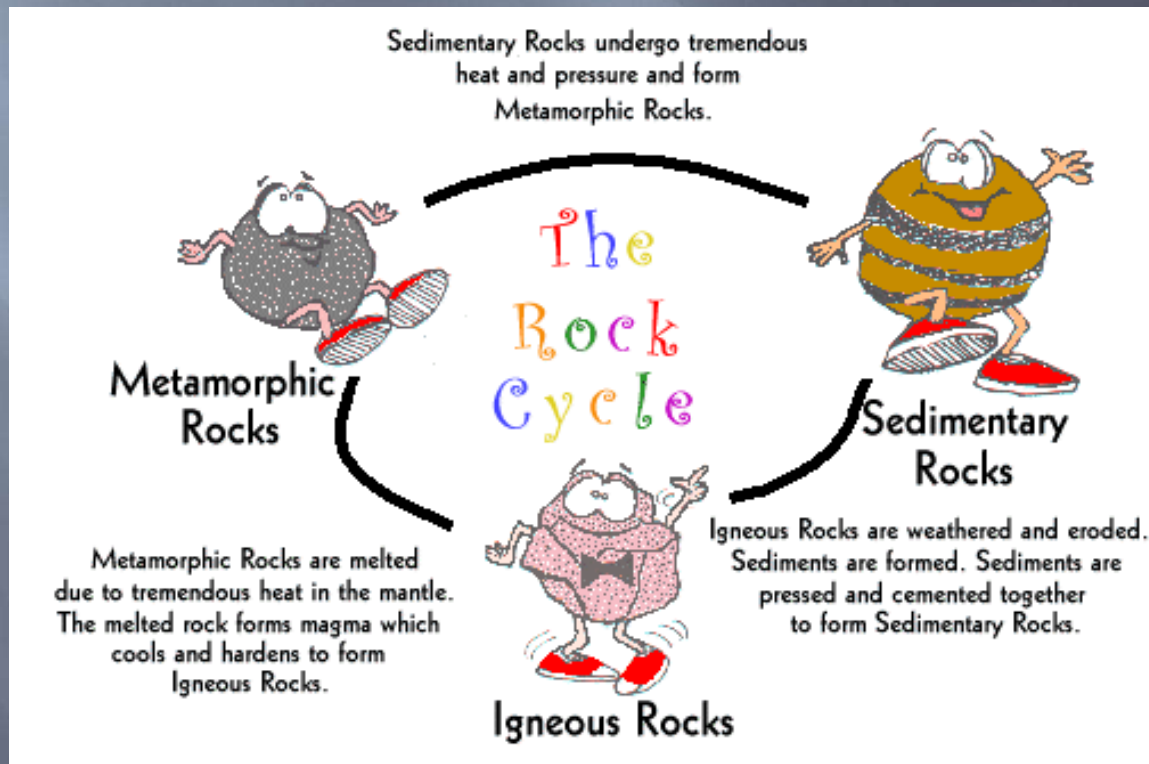
Where do metamorphic rocks usually form?

- ▣ Where magma intrudes relatively cool rock
- ▣ Near colliding plates (near mountain ranges)
- ▣ Places that are covered miles thick with other rock causing pressure
- ▣ When hot water intrudes rock
- ▣ Where a meteorite strikes Earth (rare)
- ▣ Where lightning bolts strike rocks (rare)



What is the process through which rocks change?

- ▣ The Rock Cycle is a series of processes on Earth's surface and in the crust and mantle that slowly change rocks from one kind to another



Once a rock is formed, does it stay the same rock forever?

▣ **NO!**

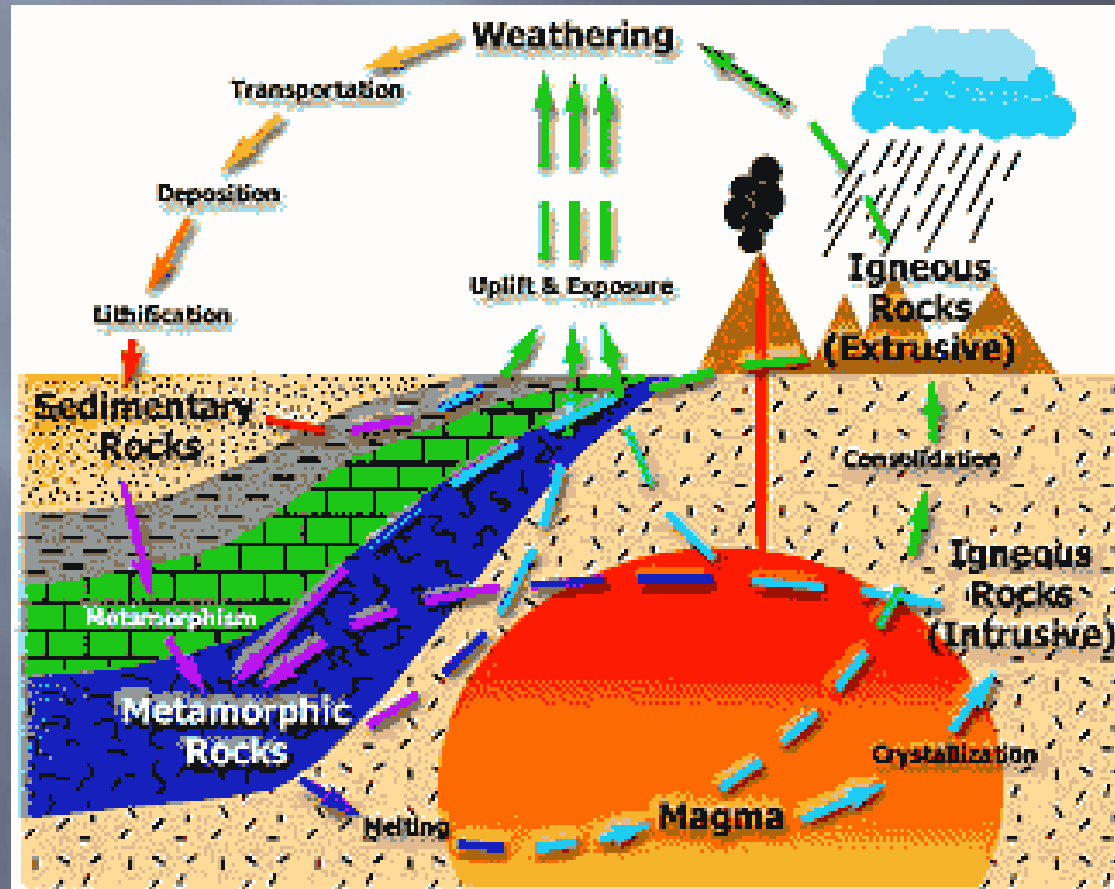
▣ Rocks are continually changed by many processes, such as weathering, erosion, compaction, cementation, melting, and cooling



▣ Rocks can change to and from the three types

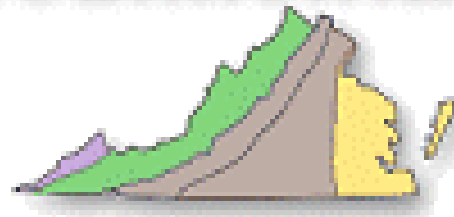
How are rocks redistributed?

- ▣ The core, mantle, & crust are one giant rock **recycling machine**



Sedimentary

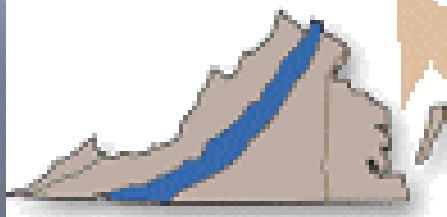
1. Weathering,
2. Transport,
3. Deposition,
4. Cementation
5. Compaction



1. Weathering,
2. Transport,
3. Deposition,
4. Cementation
5. Compaction

1. Melting,
2. Cooling,
3. Crystallization

Igneous



1. Melting,
2. Cooling,
3. Crystallization

Heat and/or
Pressure

Metamorphic

Heat and/or
Pressure

