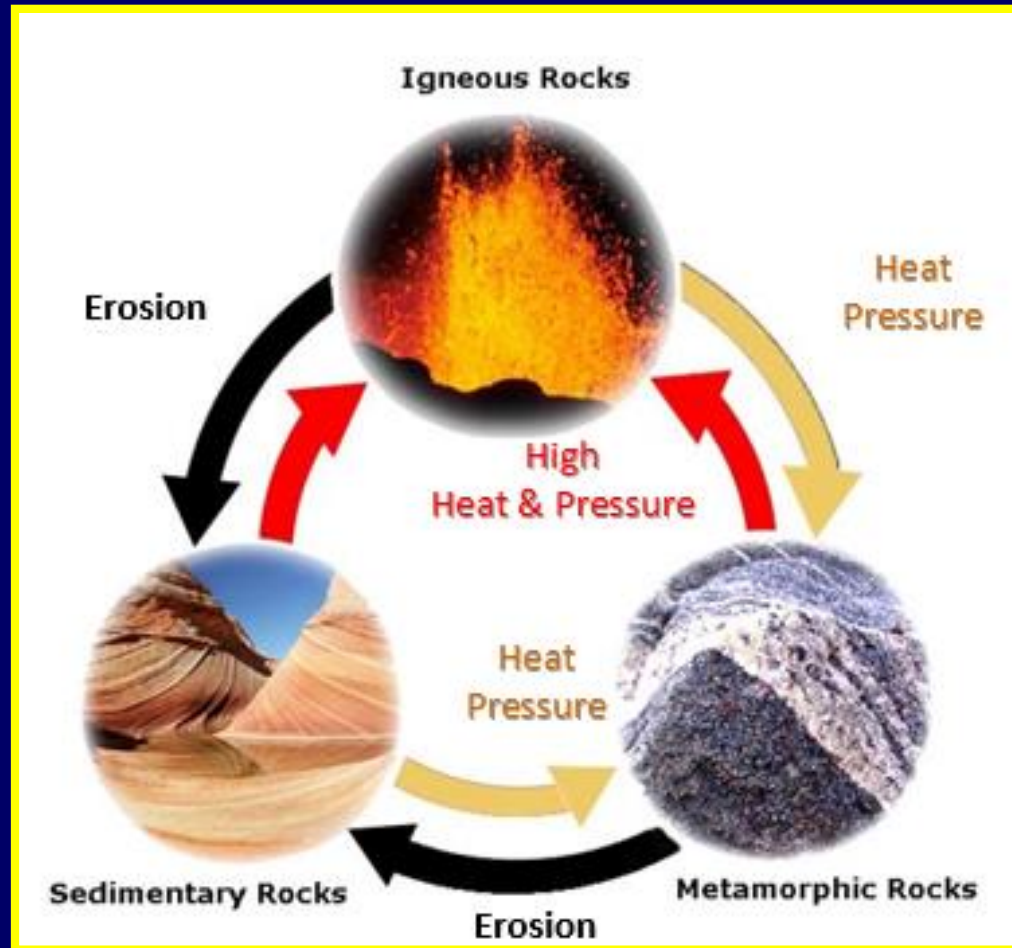


# The Rock Cycle



# Essential Standard 2.1

Explain how processes and forces affect the lithosphere.

## Learning Objective 2.2.2

Explain how the rock cycle impacts the lithosphere.

# I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I can distinguish between a rock and a mineral
- I can identify three types of rock and list some of their characteristics
- I can describe the process by which the three types of rocks are formed

# Minerals

Minerals are naturally occurring, inorganic solids with specific chemical compositions and definite crystalline structure.



Quartz  
 $\text{SiO}_2$



Feldspar  
 $\text{AlSiO}_2$



Mica  
 $\text{K}_2(\text{Mg,Fe})_{6-5}\text{Al}_{0-1}$   
 $(\text{Si}_{6-5}\text{Al}_{2-3})\text{O}_{20}(\text{OH,F})_4$



# Rocks

Rocks are mixtures of minerals and organic matter

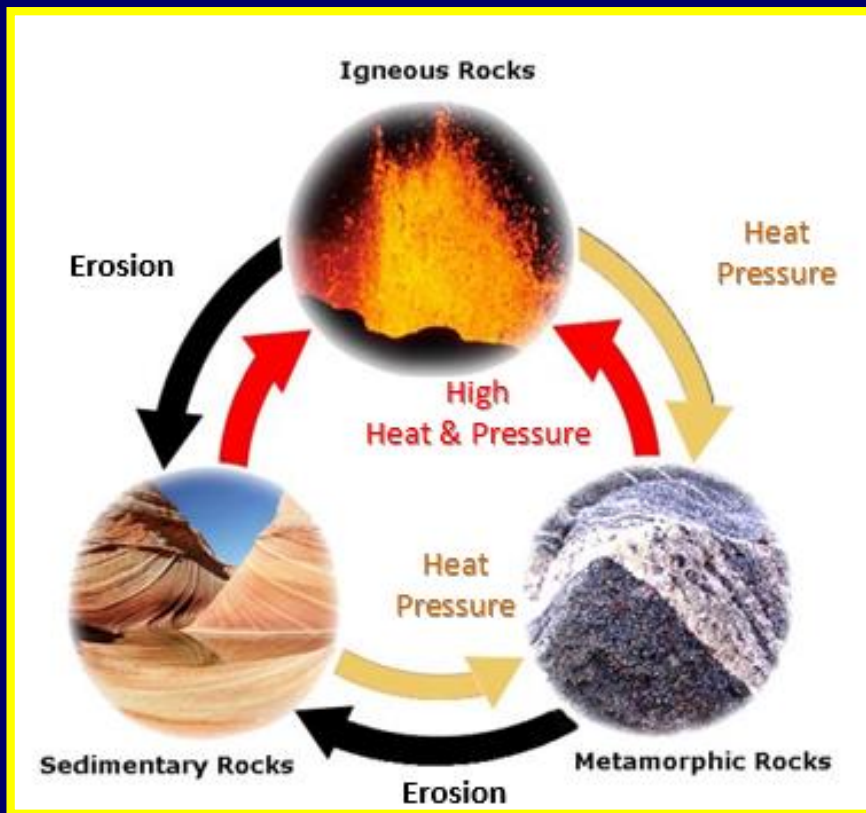


Gneiss

Quartz, Feldspar, Mica

# Rock Cycle

When rocks form, they do not stay the same, nor stay in the same place forever.



As they undergo weathering, erosion, heat and pressure, they change into other rock types.

# Types of Rocks

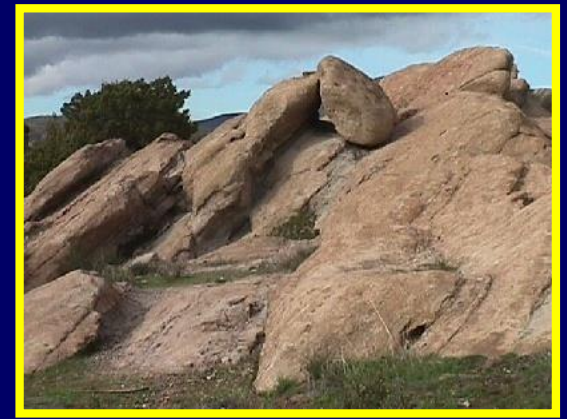
There are three main types of rocks.



Igneous  
Rocks



Sedimentary  
Rocks



Metamorphic  
Rocks

# Igneous Rocks

Igneous rocks are formed from the cooling and crystallization of magma on or near the Earth's surface.





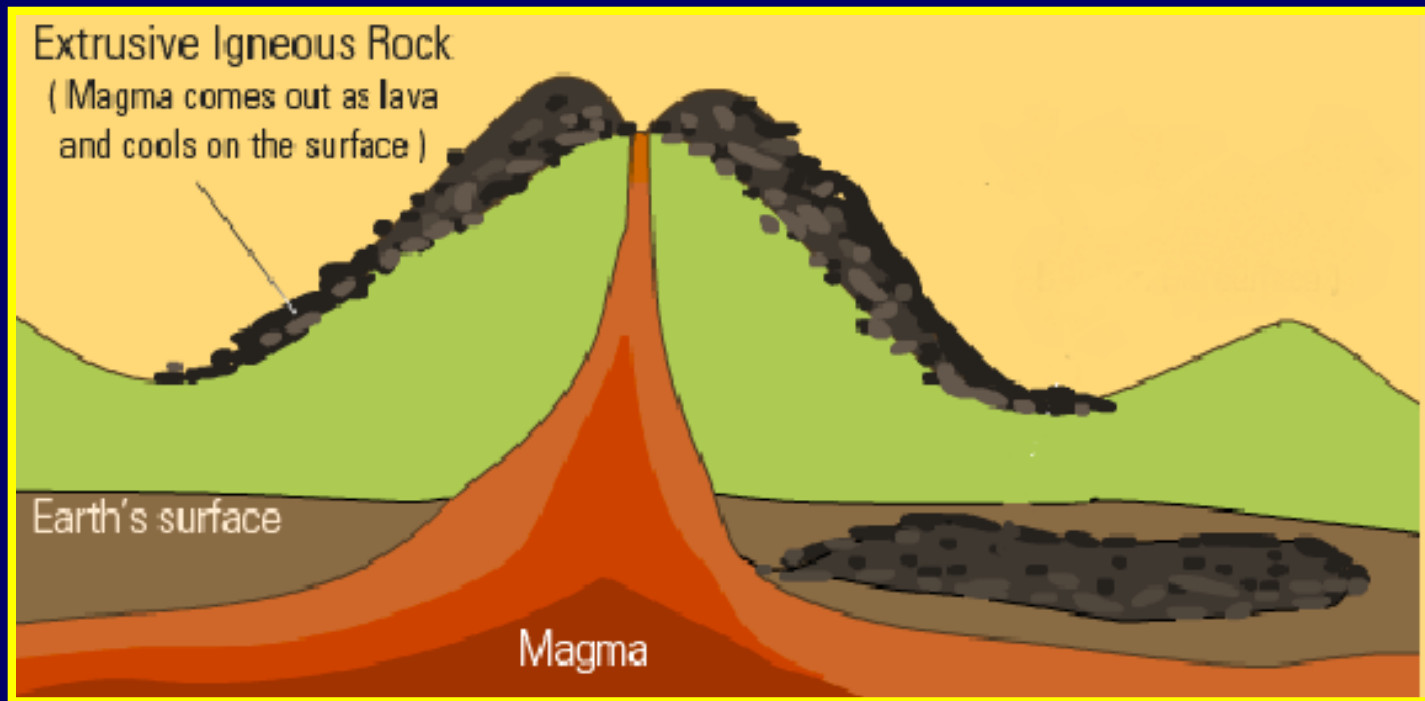
# Igneous Means Fire

The term *igneous* comes from the Latin word *ignis*, which means “fire” because early geologists associated igneous rocks with fiery lava flows.



# Extrusive Igneous Rocks

Extrusive igneous rocks cool quickly on Earth's surface after lava flows onto the surface of Earth.





# Extrusive Igneous Rocks

Because extrusive igneous rocks cool so quickly, they don't have a chance to form large crystals, so they are glassy, or have lots of pores, or are fined grained.



Obsidian



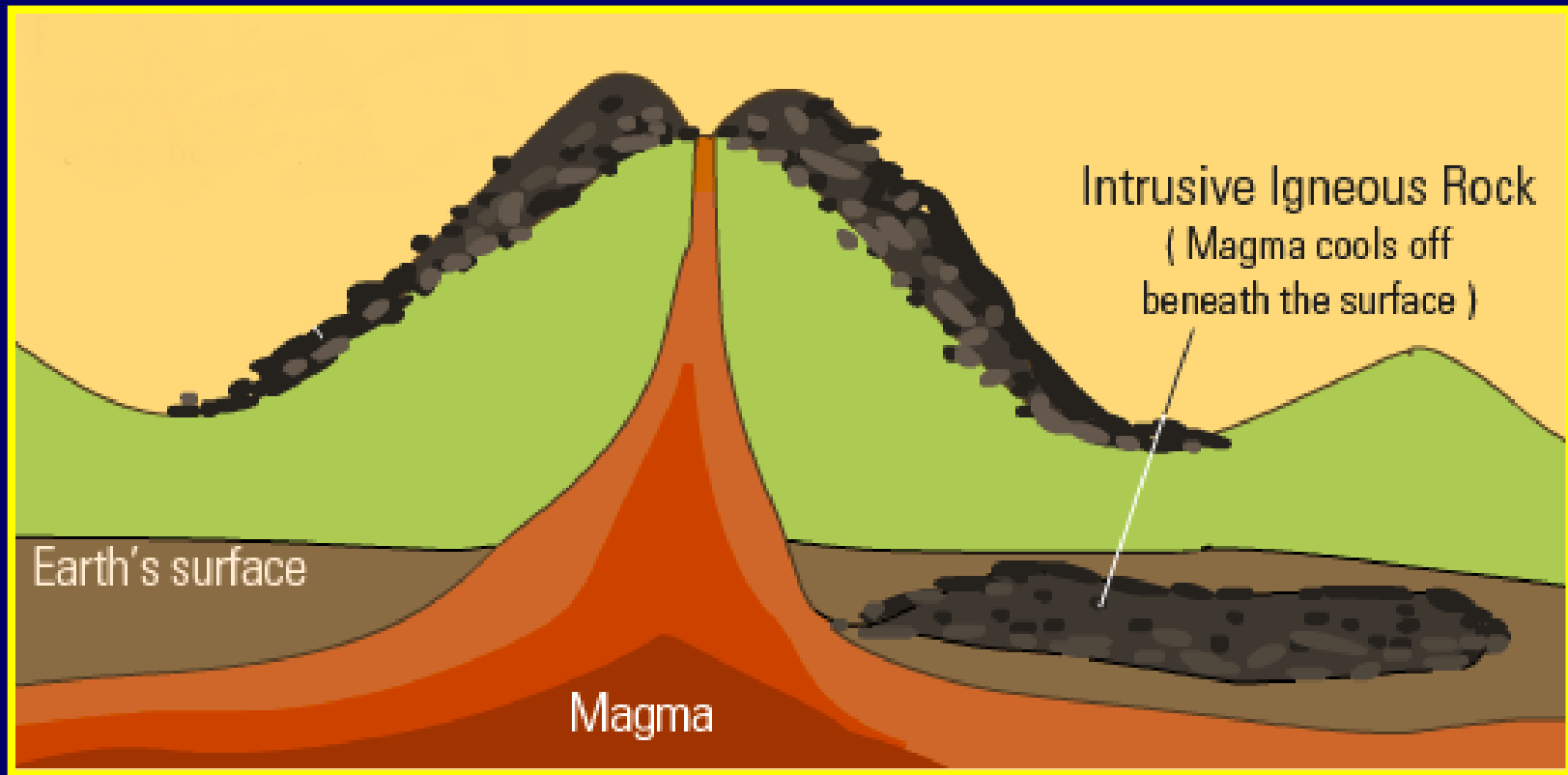
Pumice



Basalt

# Intrusive Igneous Rocks

Intrusive igneous rocks cool very slowly beneath the surface of Earth.



# Intrusive Igneous Rocks

Because intrusive igneous rocks have more time to cool, they develop large crystals and are very hard rocks.



Granite



Gabbro



# Cross Cutting and Rock Veins

Sometimes the igneous rocks will crack and new magma will squeeze into the fractures and solidify.



# Quartz and Gemstones

Quartz made of silicon dioxide,  $\text{SiO}_2$ , is often found inside igneous rock veins.



Gemstones, such as garnet, can also be found inside igneous rock veins.





# Mineral Ores

Metal mineral ores, such as gold, silver, and nickel, can also be found inside the veins of igneous rock.



Gold Veins



# Igneous Rocks as Resources

Granite's strength and resistance to weathering has made it a very useful building material.

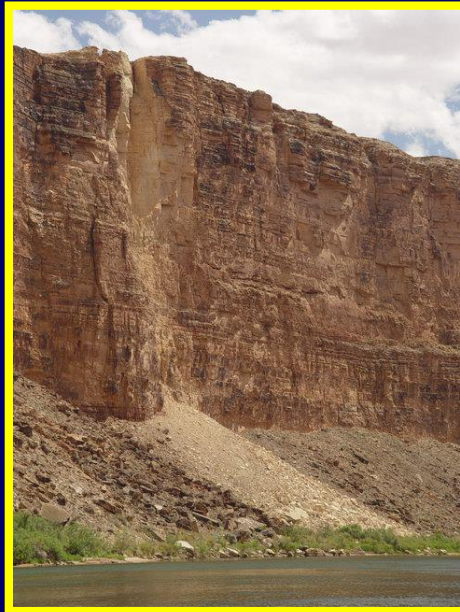


Zoser's  
Step Pyramid  
2648 BC

World's oldest granite structure.

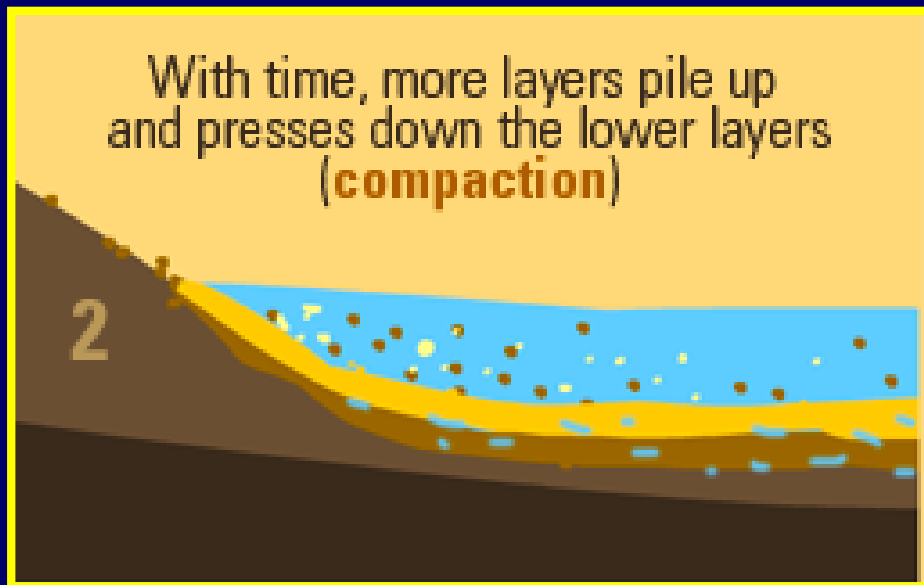
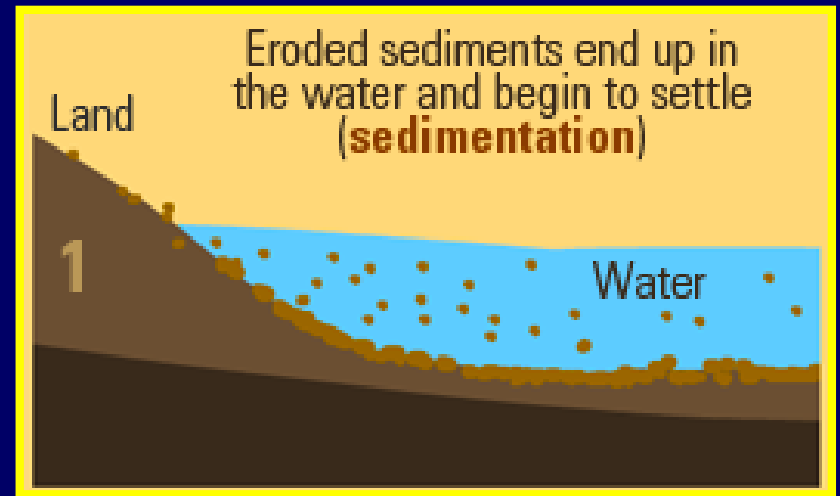
# Sedimentary Rocks

Tiny debris (also known as sediments) from eroded mountains and rock masses, together with the sand and other particles are often washed downslope into water bodies.



# Sedimentary Rocks

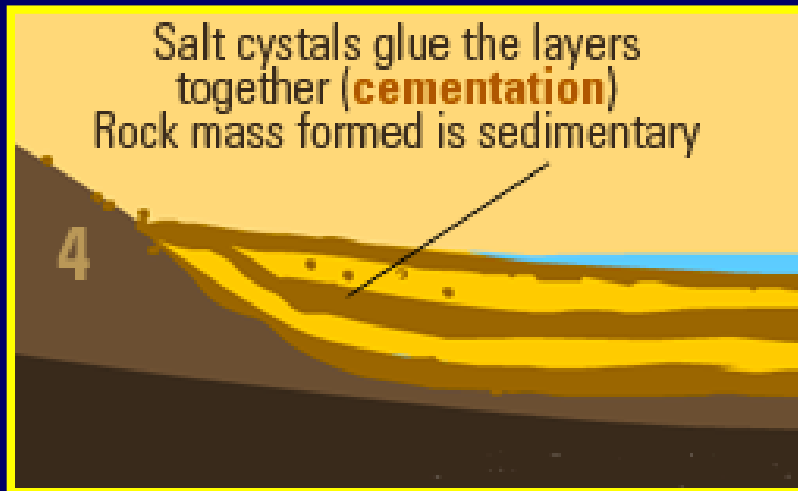
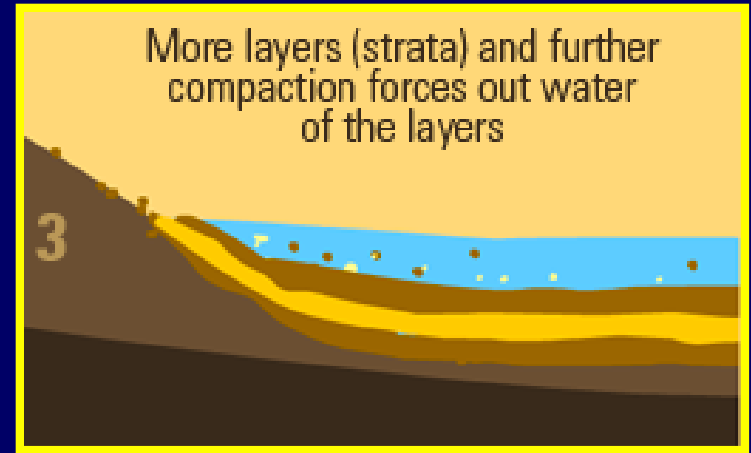
The sediments slowly settle under water in a process called sedimentation.



Over time, layers of sediments harden due to the weight above, in a process called compaction.

# Sedimentary Rocks

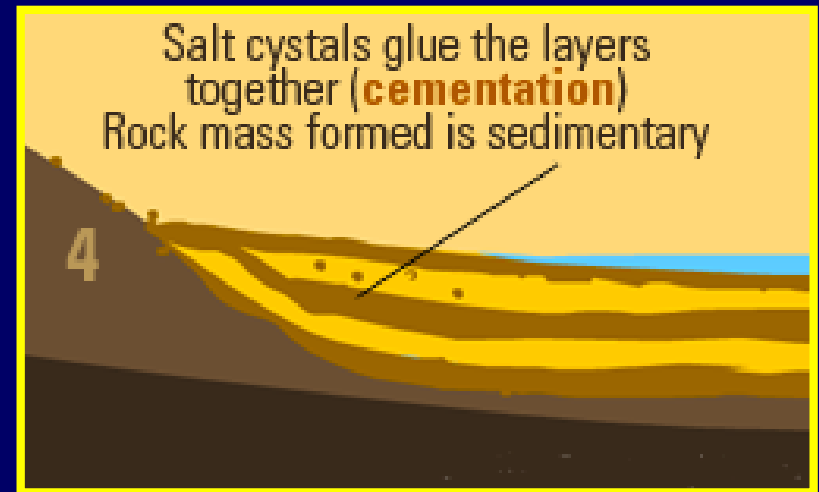
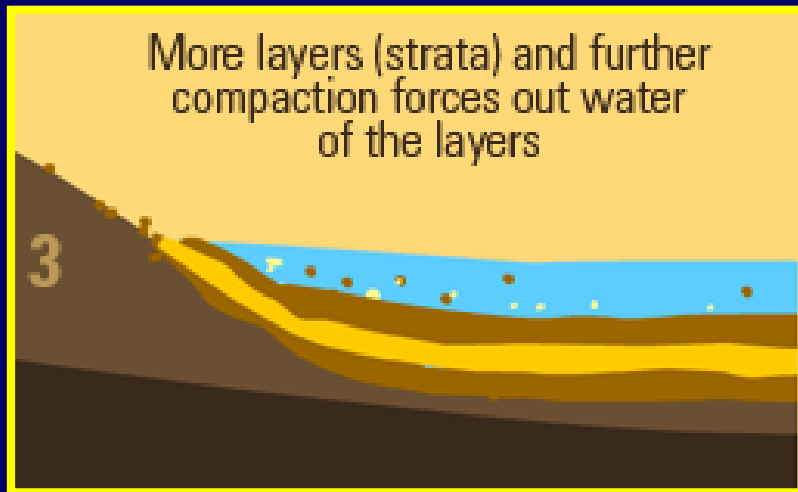
As more layers of sediment are added, further compaction forces water out of the layers.



Compaction leads to cementation, which is the gluing or cementing of pieces of rock together by salt compounds.

# Sedimentary Rocks

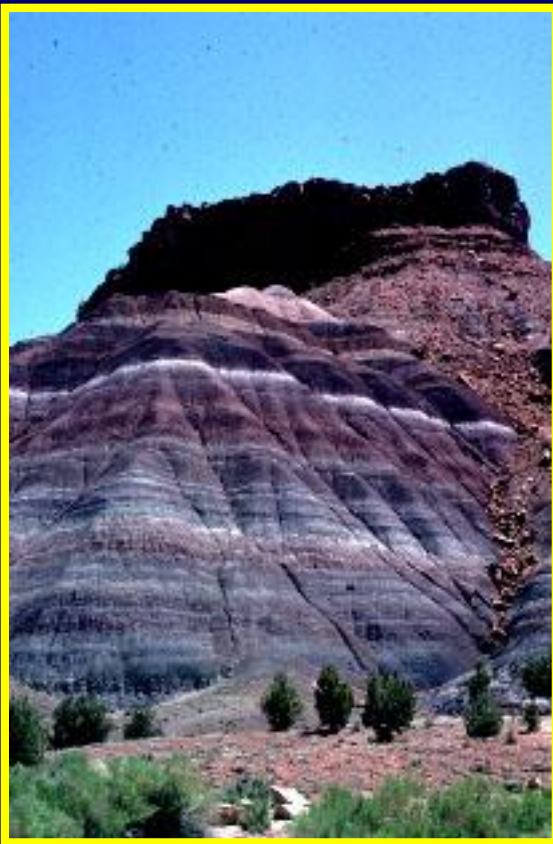
Sometimes the source of sediments are from shells or coral that are then compacted and cemented into rock.





# Features of Sedimentary Rock

The primary feature of sedimentary rock is horizontal layering called bedding.





# Features of Sedimentary Rock

Another feature of sedimentary rocks are fossils, which are the preserved remains of once living organisms that become buried in the layers of sediment.



Dinosaur Footprint

# Examples of Sedimentary Rock

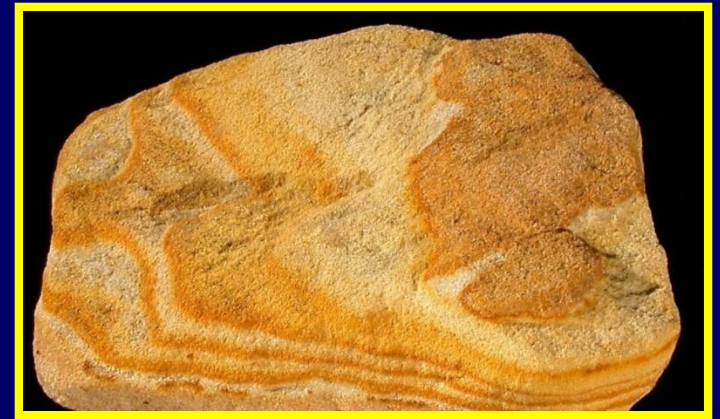
Compacted mud eventually forms clay, which upon further compaction & cementation forms shale.



Underground deposits of shale often act as barriers to groundwater flow, as well as oil and gas flow.

# Examples of Sedimentary Rock

Sandstone forms from compacted and cemented sand deposits.



White Cliffs of Dover, England

Limestone forms when broken shells or bones of marine animals, especially coral, are compacted and cemented together.



# Examples of Sedimentary Rock

Halite and gypsum form when lakes or seas evaporate leaving minerals behind that become compacted and cemented into rock.



Halite (Rock Salt)



Gypsum (Chalk)

# Examples of Sedimentary Rock

Coal is formed from the remains of plant material that was buried in ancient swamps that became compacted and cemented into a carbon-rich rock.



# Sedimentary Rock as Resources

Many features in sedimentary rocks can teach us a lot about Earth's history.



Not only can we learn from the remains of extinct organisms, but we can also learn where bodies of water once were, or where other changes on Earth took place.



# Sedimentary Rock as Resources

Oil and gas are found within sedimentary rock layers.



Sedimentary rock can also be used to create cement and bricks.

# Metamorphic Rocks

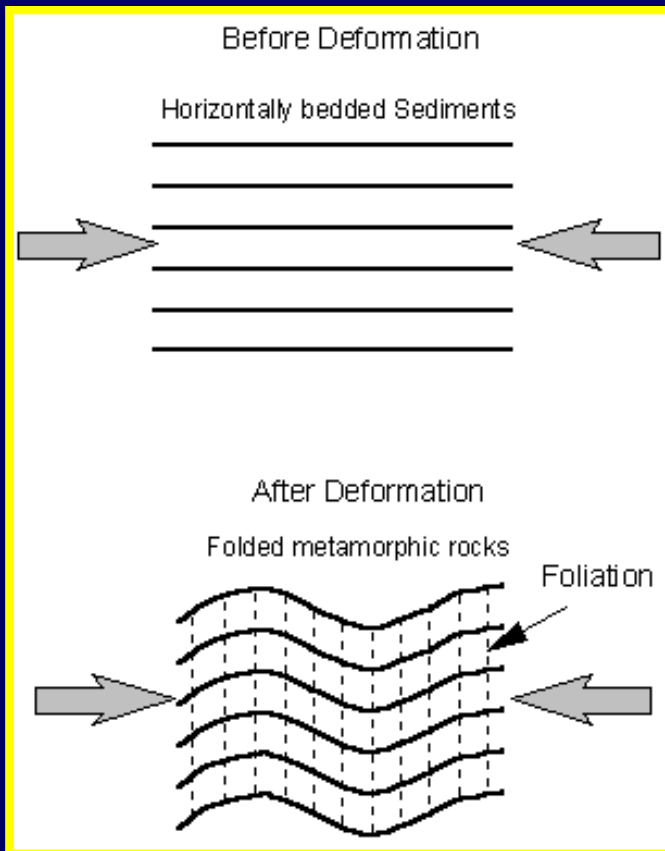
Metamorphic rocks are the least common of all the three types of rocks.



They are igneous and sedimentary rocks that have been transformed under extreme heat and pressure.

# Meta Morphe

“Meta” means change and  
“morphe” means form.

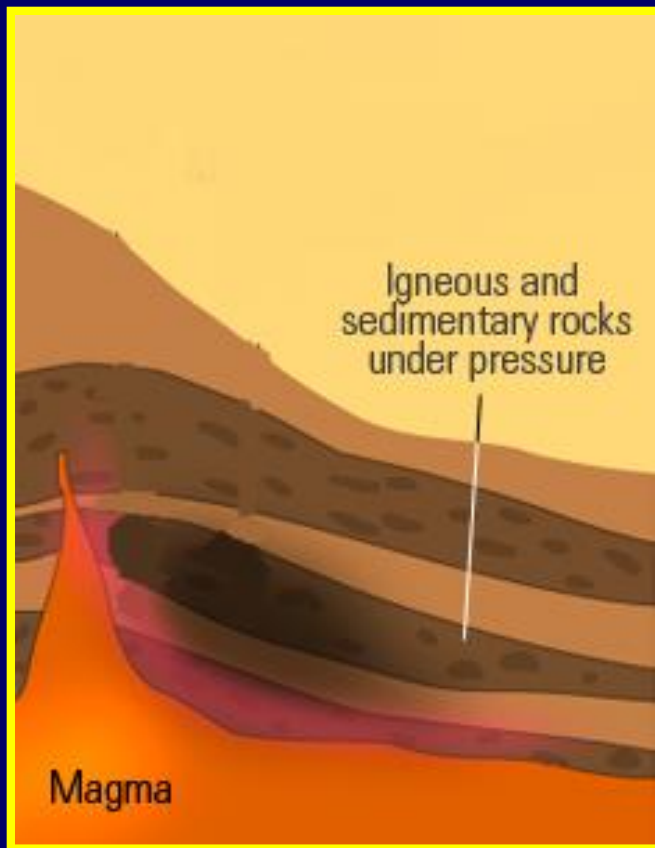


During metamorphism,  
a rock changes form  
while remaining solid.



# Extreme Pressure

Earth movements, such as mountain formation, causes rock beds to shift and move.

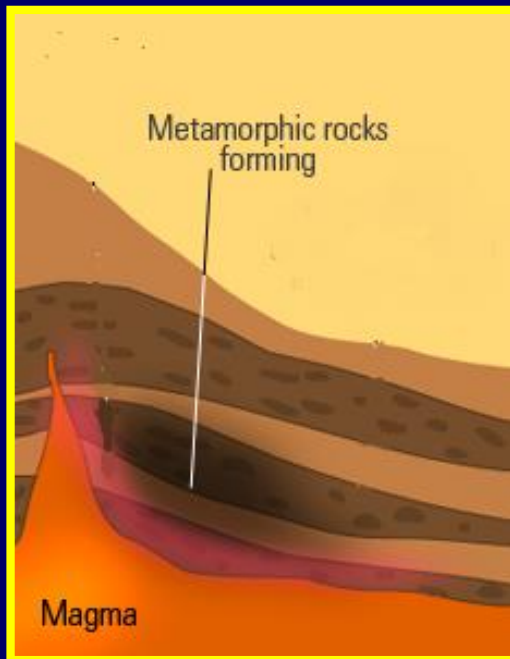


The movement causes other rock types to be squeezed, putting them under extreme pressure.



# Extreme Heat

Heat from the magma, geothermal heat, or heat from friction along faults cause the existing rocks to change form.



Over time, extreme pressure and heat transform the original rocks into metamorphic rocks.

# Extremely Hot Water

Hydrothermal metamorphism occurs when very hot water reacts with rock, altering its chemistry and mineralogy.



Hydrothermal Vents



Hot Springs

# Characteristics

If the rock originally had layers, then the layers will be wavy after metamorphism occurs.



If the rocks originally had crystals, then the crystals will be larger & blockier.





# Examples of Metamorphic Rock

Some examples of metamorphic rocks include slate, and schist, which derive from sedimentary shale.



Slate



Sedimentary  
Shale

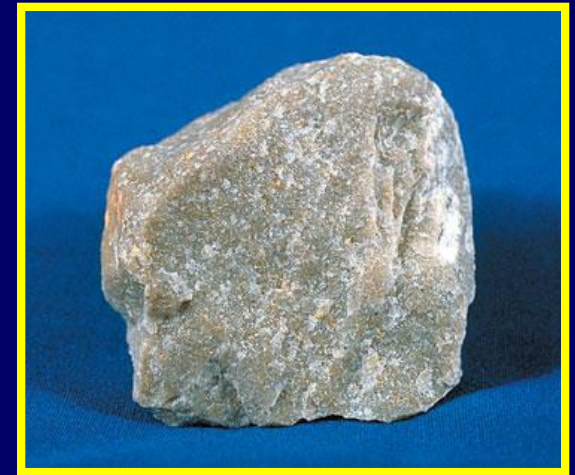


Schist



# Examples of Metamorphic Rock

Quartzite is a metamorphic rock that is derived from sedimentary sandstone.



Quartzite

Marble is a metamorphic rock that is derived from sedimentary limestone.



Marble

# Examples of Metamorphic Rock

Gneiss is a metamorphic rock that is derived from granite and is commonly found in mountain regions.



1

Granite

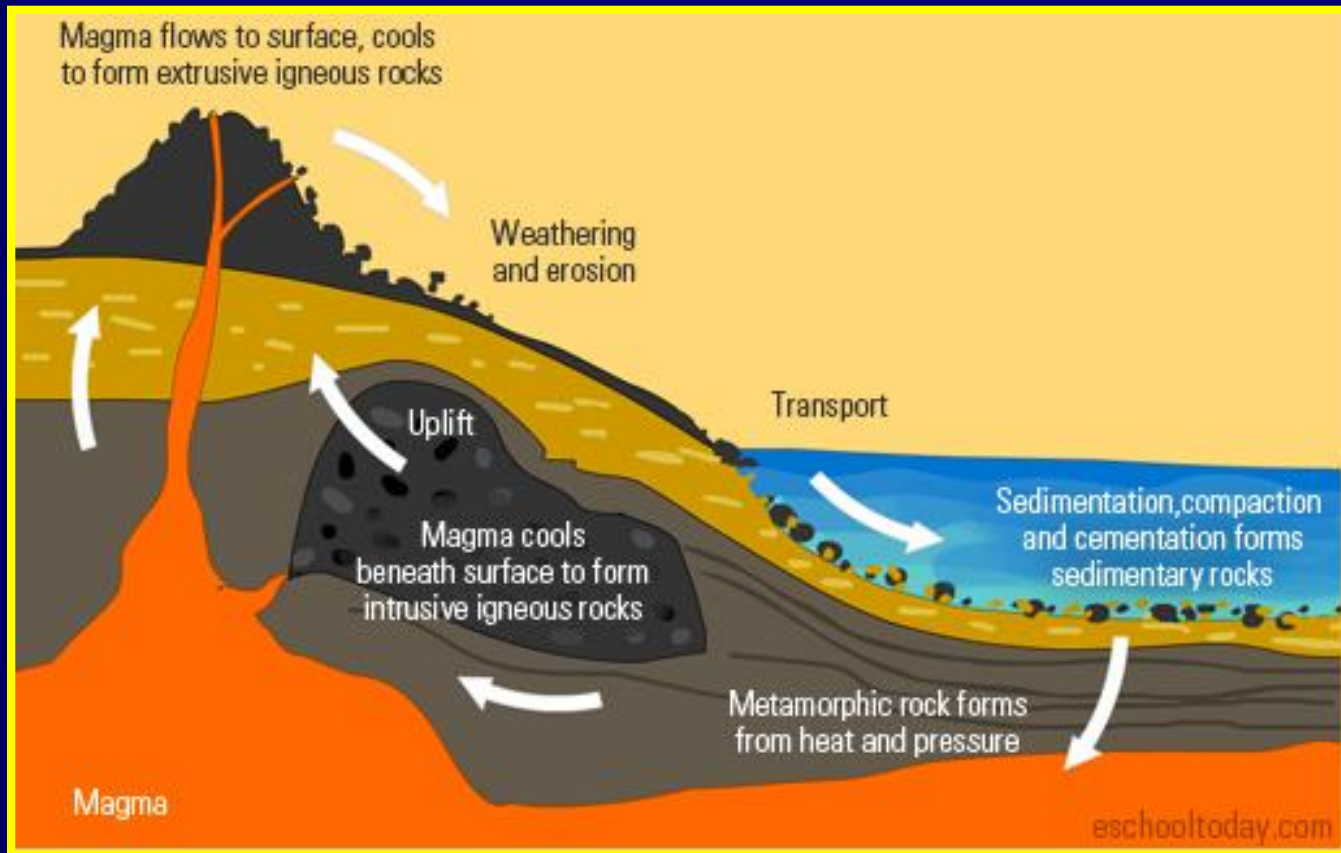


2

Gneiss

# The Rock Cycle

The rock cycle is the entire journey rocks make as they change over millions of years.





# I Can Statements

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# The End

