

GEOLOGY

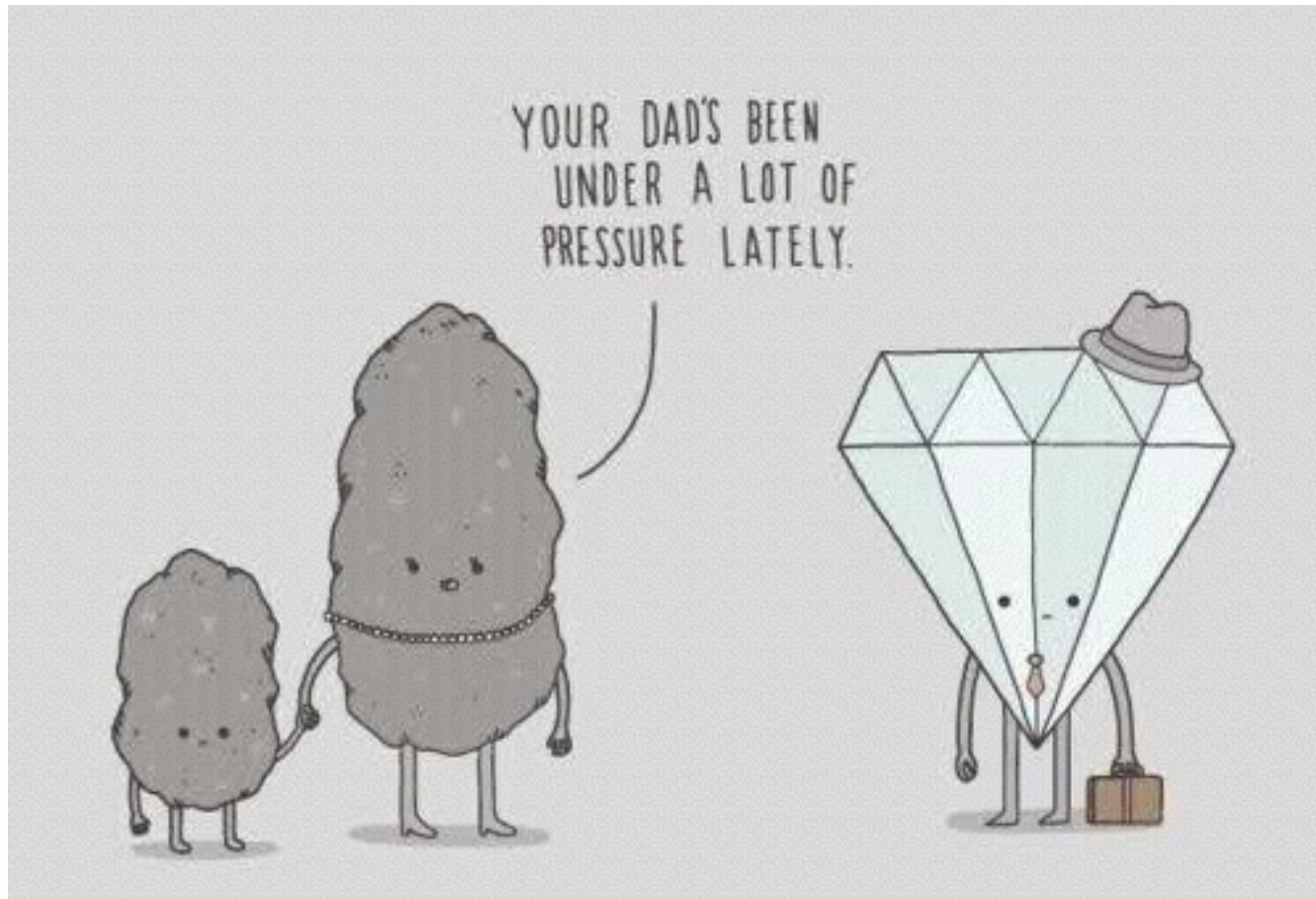


ROCKS!

Lesson #16

Rocks and the Rock Cycle

The Rock Cycle



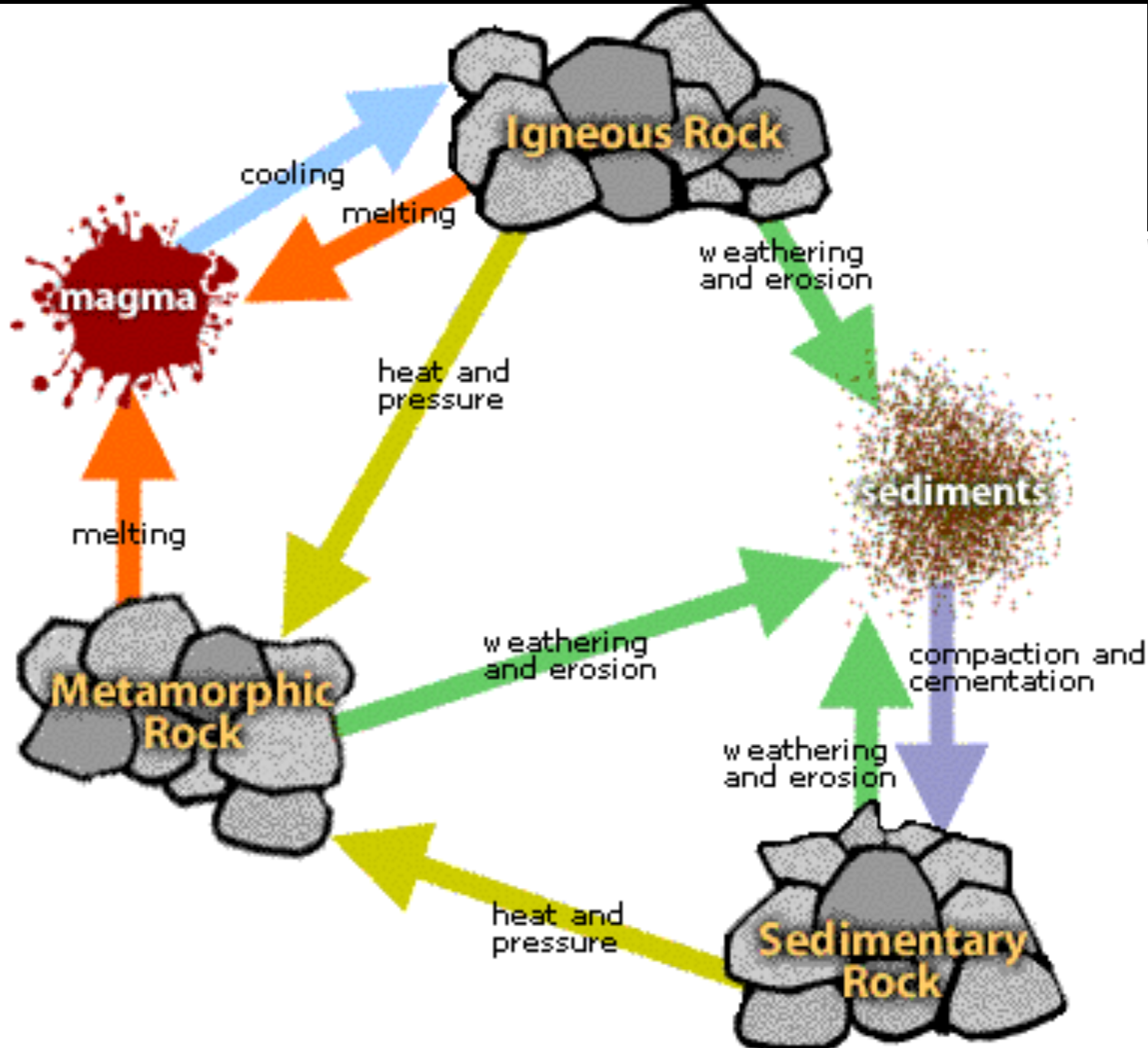
Geology

Name the three types of rock.



1. Classic
2. Punk
3. Hard





What You Will Learn

- Rocks can vary because of the different minerals that make them up.
- Yet, even rocks made up of the same minerals can be quite different.
- In this lesson, you will learn about the three main groups of rocks and how rocks form and change.



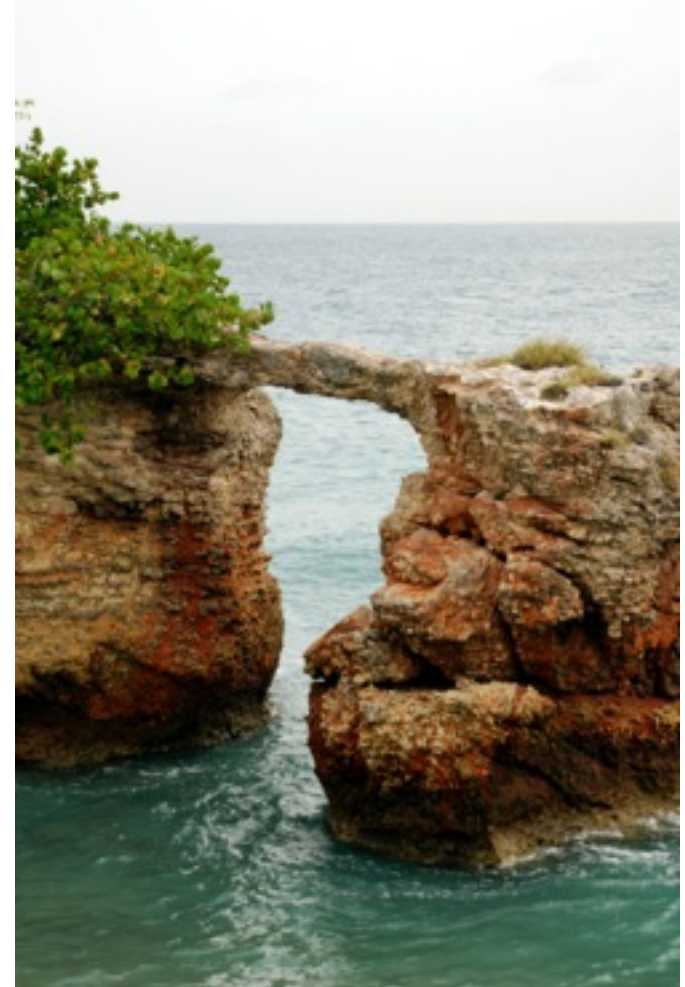
Rockin' Words to Know

- Look these bad boys up-
 - Rock
 - Igneous
 - Magma
 - Lava
 - Sedimentary
 - Metamorphic



What are Rocks?

- A rock is a naturally occurring solid mixture of one or more minerals, or organic matter
- Rocks are classified by how they are formed, their composition, and texture
- Rocks change over time through the rock cycle



Classification of Rocks

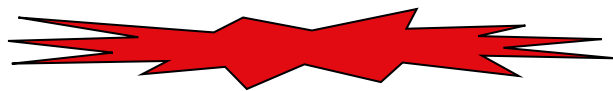
- A rock is a naturally occurring solid material that is made up of one or more materials.
- There are three main types of rocks: igneous, sedimentary, and metamorphic.
- Rocks change shape and composition in a variety of ways.
- The way rocks form determine what type of rock it is.

Igneous Rocks





MAGMA

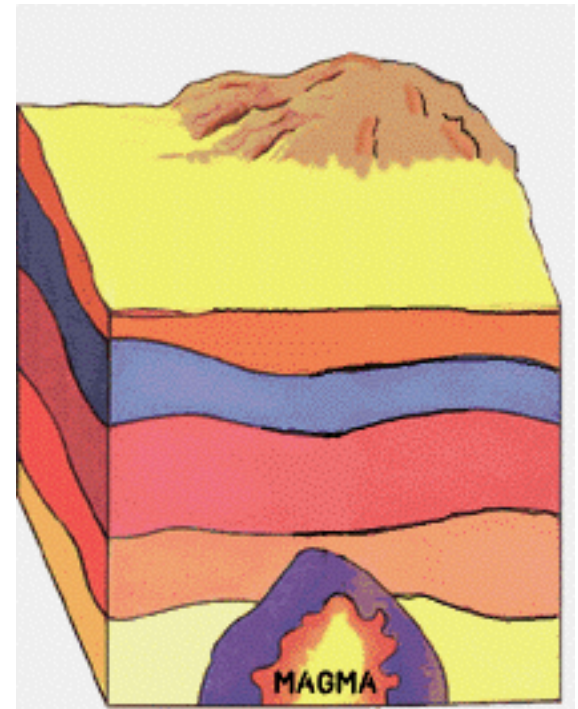


Igneous Rock

- An igneous rock is a rock that forms when melted rock cools and hardens.
- Some igneous rock, such as granite, forms from magma.
- Magma is melted rock located below the earth's surface.
- Magma is less dense than the surrounding rock, so it tends to rise to higher levels of the earth's crust.
- Basalt is another kind of igneous rock, but it forms from lava.
- Lava is magma that reaches the earth's surface from volcanoes.

Igneous Rocks

- Igneous rock begins as magma.
- Magma can form:
 - When rock is heated
 - When pressure is released
 - When rock changes composition
- Magma freezes between 700 °C and 1,250 °C
- Magma is a mixture of many minerals



Igneous Rocks

Coarse-Grained

Fine-Grained

Felsic

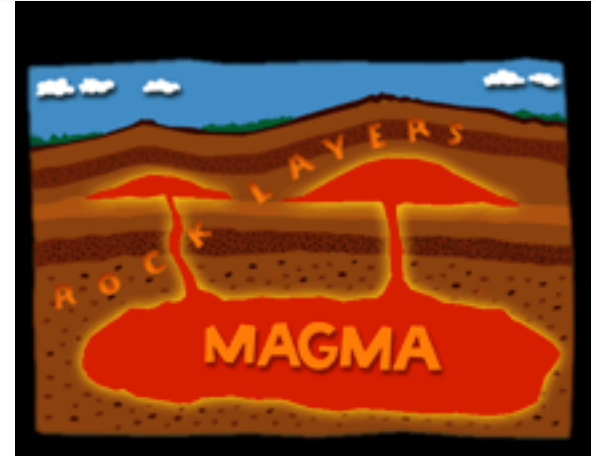


Mafic



Igneous Rocks

- Intrusive Igneous Rocks: magma pushes into surrounding rock below the Earth's surface
- Extrusive Rocks: forms when magma erupts onto the Earth's surface (lava), cools quickly with very small or no crystals formed



Igneous Rocks

Obsidian is a dark-colored volcanic glass that forms from the very rapid cooling of molten rock material. It cools so rapidly that crystals do not form.



Sedimentary Rocks

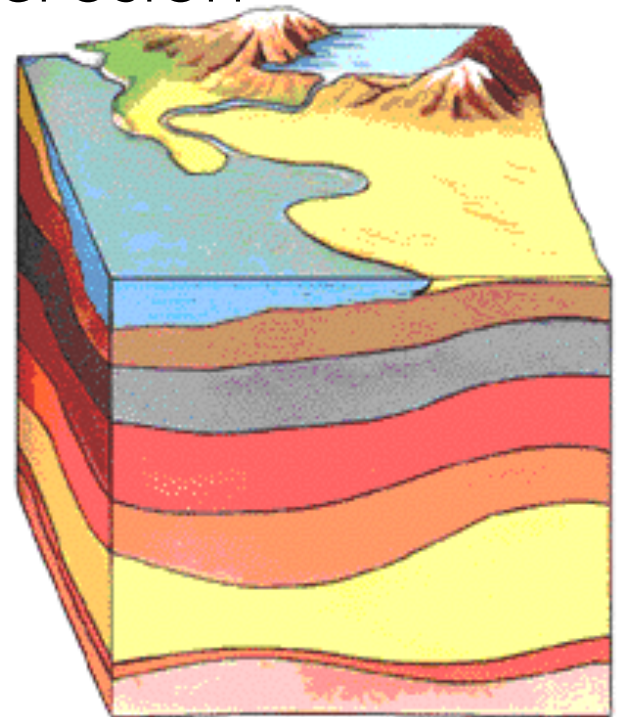


Sedimentary Rock

- Sedimentary rock is formed from sediment.
- Sediment is deposited pieces of rock that have been broken into smaller pieces by erosion, wind and moving water-like pebbles and sand.
- The sediment is eroded from mountains and landforms and washed down to a body of water.
- Over a long period of time, layers of sediment build up. The weight of the layers compacts the sediments.
- Chemical changes also cement the layers together.

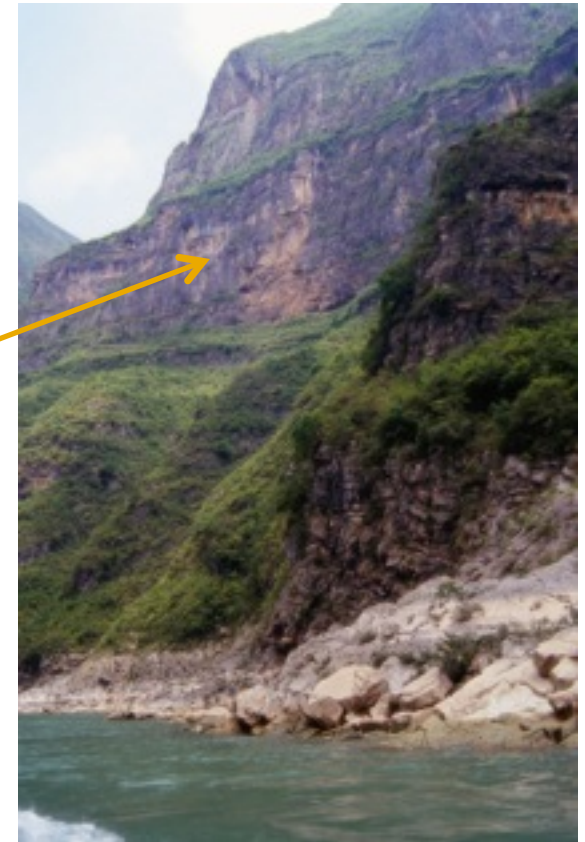
Sedimentary Rocks

- Sedimentary rock is formed by erosion
- Sediments are moved from one place to another
- Sediments are deposited in layers, with the older ones on the bottom
- The layers become compacted and cemented together



Sedimentary Rock

- Sedimentary Rocks are formed at or near the Earth's surface
- No heat and pressure involved
- Strata – layers of rock
- Stratification – the process in which sedimentary rocks are arranged in layers



Sedimentary Rock

Clastic – made of fragments of rock cemented together with calcite or quartz

Breccia is a term most often used for clastic sedimentary rocks that are composed of large angular fragments (over two millimeters in diameter).

The spaces between the large angular fragments can be filled with a matrix of smaller particles or a mineral cement that binds the rock together.



Sedimentary Rock

Chemical sedimentary – minerals crystallize out of solution to become rock

Limestone is a sedimentary rock composed primarily of calcium carbonate (CaCO_3) in the form of the mineral calcite. It most commonly forms in clear, warm, shallow marine waters.

It is usually an organic sedimentary rock that forms from the accumulation of shell, coral, algal and fecal debris.



Sedimentary Rock

Organic sedimentary – remains of plants and animals

Coal is an organic sedimentary rock that forms from the accumulation and preservation of plant materials, usually in a swamp environment.

Coal is a combustible rock and along with oil and natural gas it is one of the three most important fossil fuels.

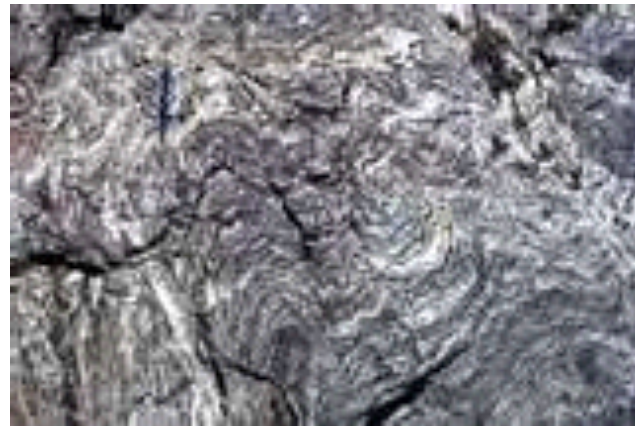


Types of Weathering

Mechanical (physical) weathering is the breakdown of rock into smaller particles due to such factors as freezing and thawing, release of pressure, water absorption, salt crystal formation, landmass uplift, expansion and contraction from the sun or fire, plant root growth, actions of animals, abrasion, or other means that do not directly affect the rock's chemistry.

Chemical weathering is the dissolution, carbonation, oxidation, or hydrolysis of rock and mineral by chemical means only, mostly from reactions with water or the acids contained in rainwater. Other materials are formed in the process. Warm, tropical climates are ideal environments for chemical weathering to take place as the chemical reactions are quickened by the bountiful rain and warm temperatures.

Metamorphic Rock

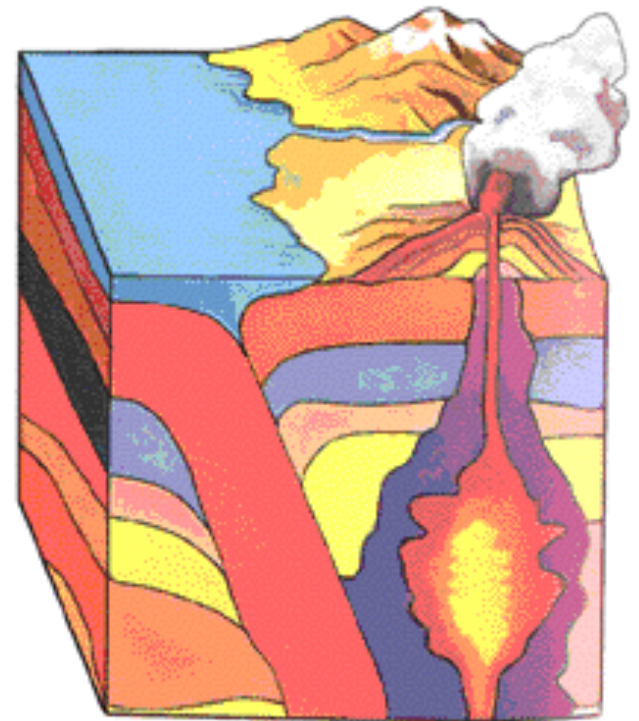


Metamorphic Rock

- Metamorphic rock occurs when surface rock becomes buried deep inside the earth.
- When this happens, extreme heat and pressure cause chemical changes in the rock.
- Both igneous and sedimentary rocks can be changed into metamorphic rock.
- Metamorphic rock itself can be change into a different kind of metamorphic rock.
- Large pieces of the earth's crust can collide and the rock will be forced downward.
- At the lower levels, the intense heat and pressure “cooks” and squeezes the rock.
- The temperature at which metamorphism occurs ranges from 50 degrees Celsius to 1000 degrees Celsius.
- Metamorphic rocks are usually very hard and sometimes have a striped or banded look (because all of the pressure makes the crystals line up flat). They also tend to have a flaky or grainy texture when broken and will often break apart in sheets.

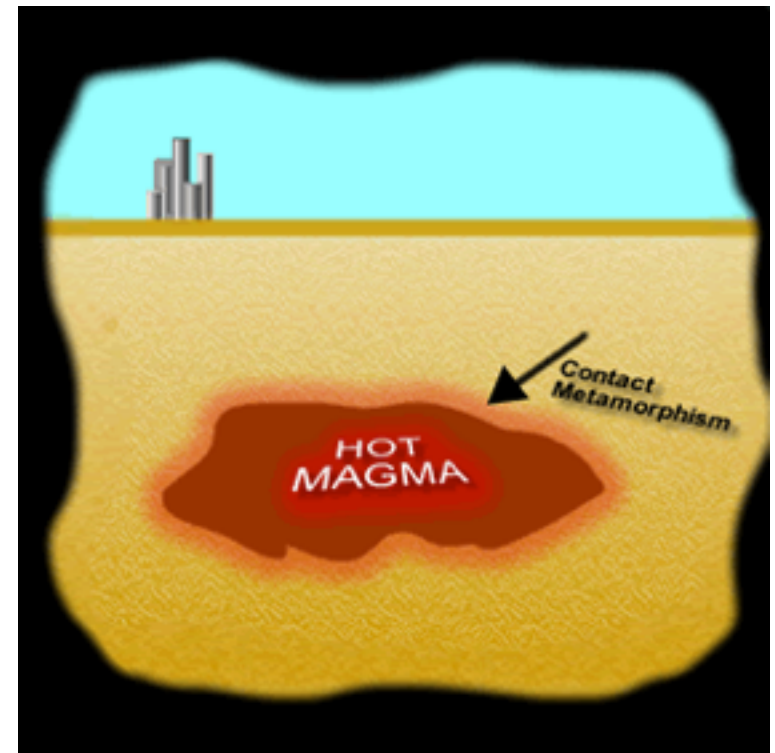
Metamorphic Rock

- Means to change shape
- Changes with temperature and pressure, but remains solid
- Usually takes place deep in the Earth



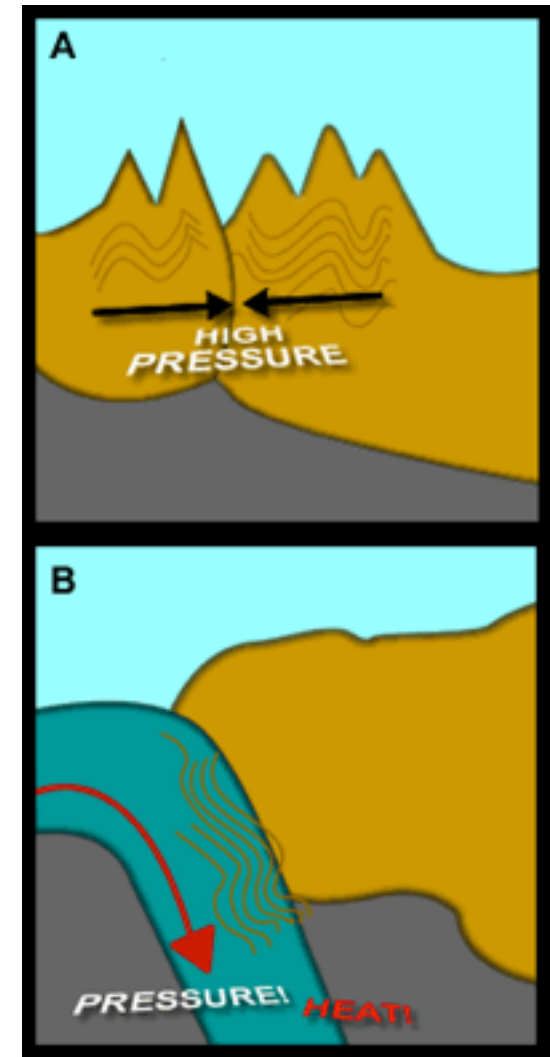
Metamorphic Rocks

- Contact Metamorphism – heated by nearby magma
- Increased temperature changes the composition of the rock, minerals are changed into new minerals



Metamorphic Rocks

- Regional Metamorphism – pressure builds up in rocks that is deep within the Earth
- Large pieces of the Earth's crust collide and the rock is deformed and chemically changed by heat and pressure



Metamorphic Rock

- Foliated - contain aligned grains of flat minerals

Gneiss is foliated metamorphic rock that has a banded appearance and is made up of granular mineral grains.

It typically contains abundant quartz or feldspar minerals.



Metamorphic Rock

- Non-Foliated – mineral grains are not arranged in plains or bands

Marble is a non-foliated metamorphic rock that is produced from the metamorphism of limestone.

It is composed primarily of calcium carbonate.



Metamorphic Rock



Amphibolite



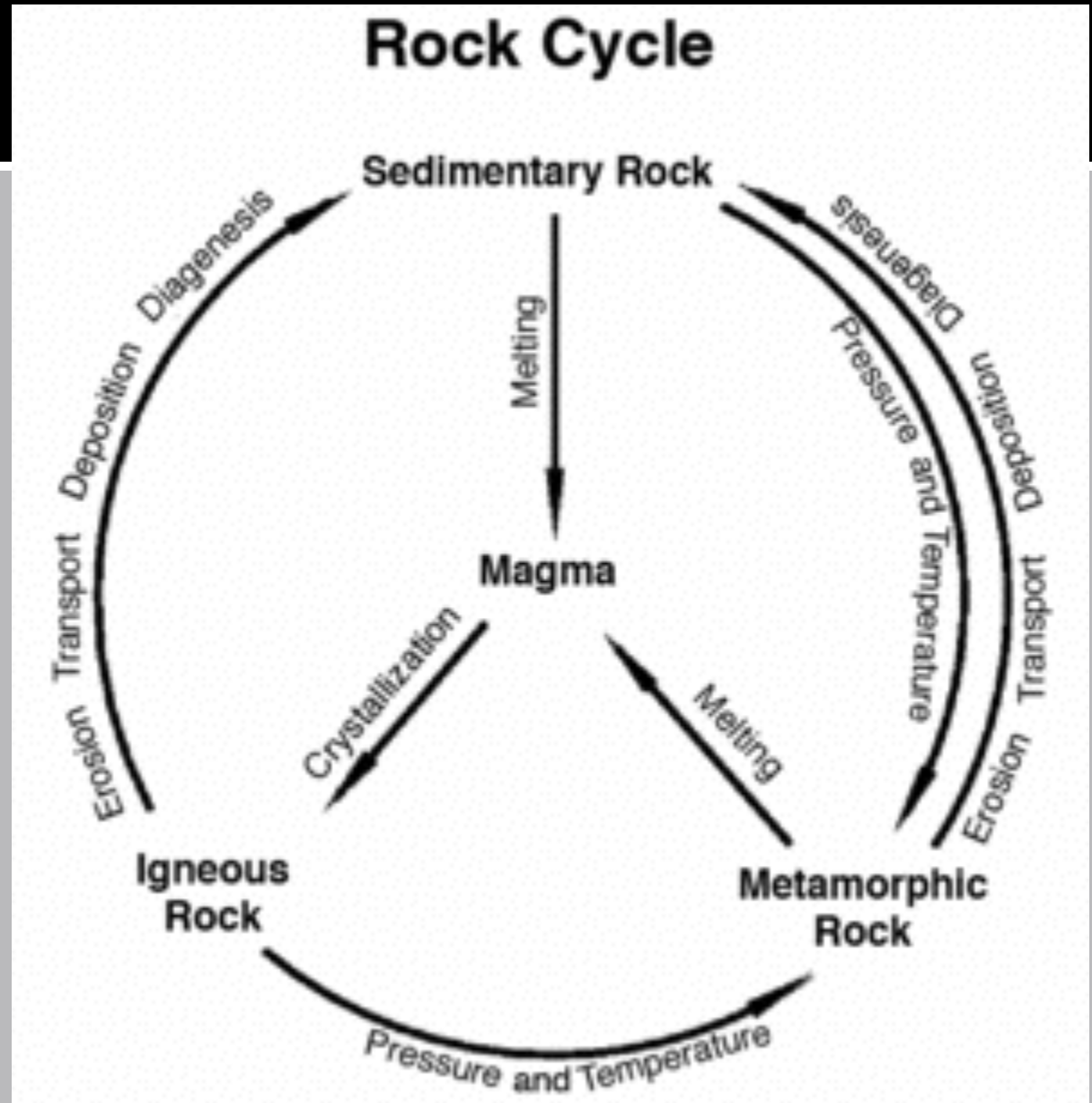
Quartzite



Phyllite

Foliated

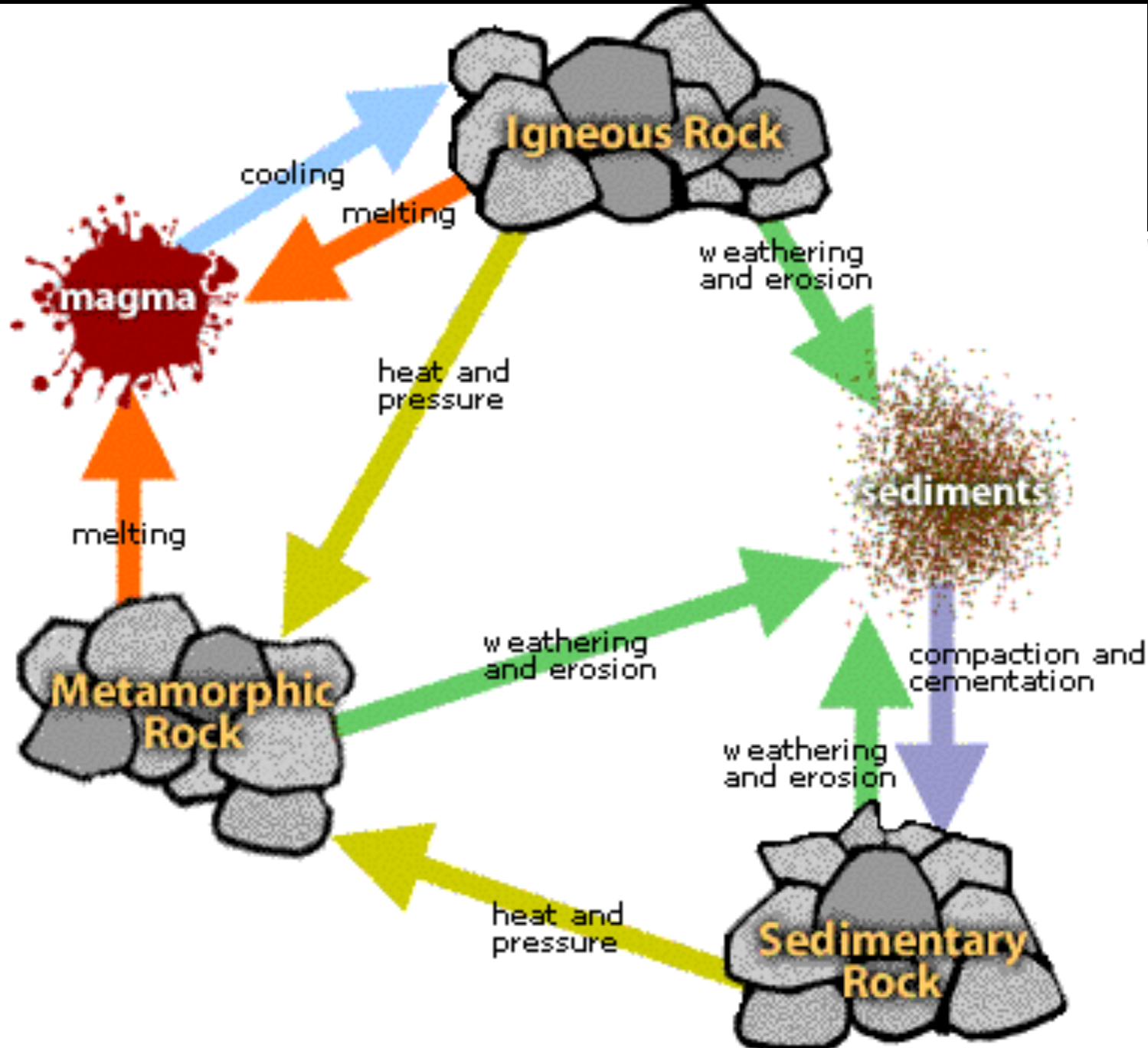
The Rock Cycle



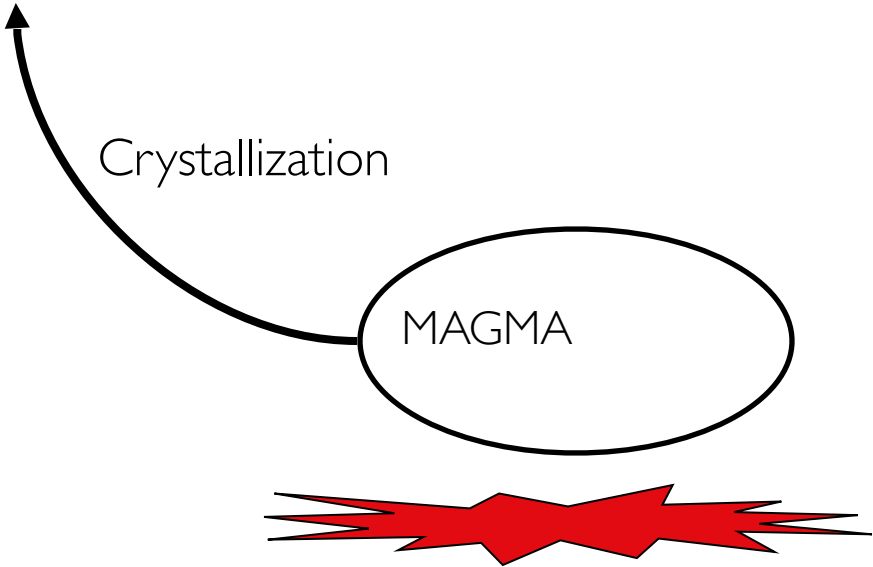
The Rock Cycle

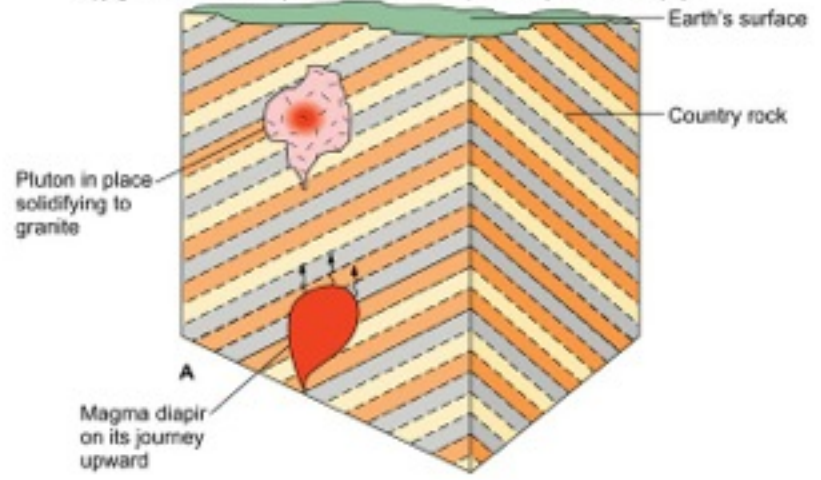
- Once rock forms, it may stay in the same form for millions of years.
- However, rock can also change.
- Any of the three major types of rock can change into one of the other type.
- The ongoing process of change that rock undergoes is the rock cycle.

- The rock cycle includes many different pathways.
- These changes are constantly taking place.
- Some happen quickly , as when lava hardens after a volcanic eruption.
- Some happen slowly, over millions of years.
- Rocks are created, transformed, and destroyed by this process.

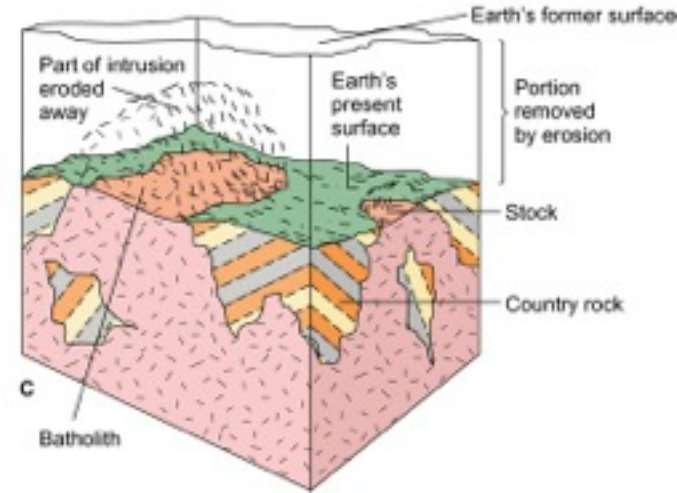
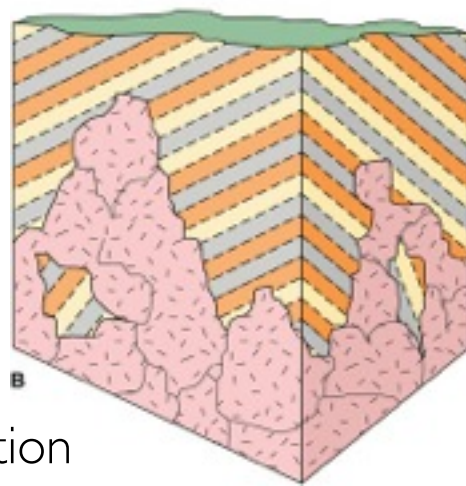


IGNEOUS



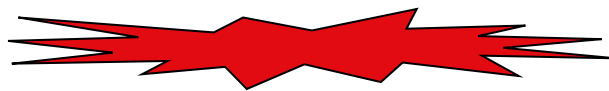


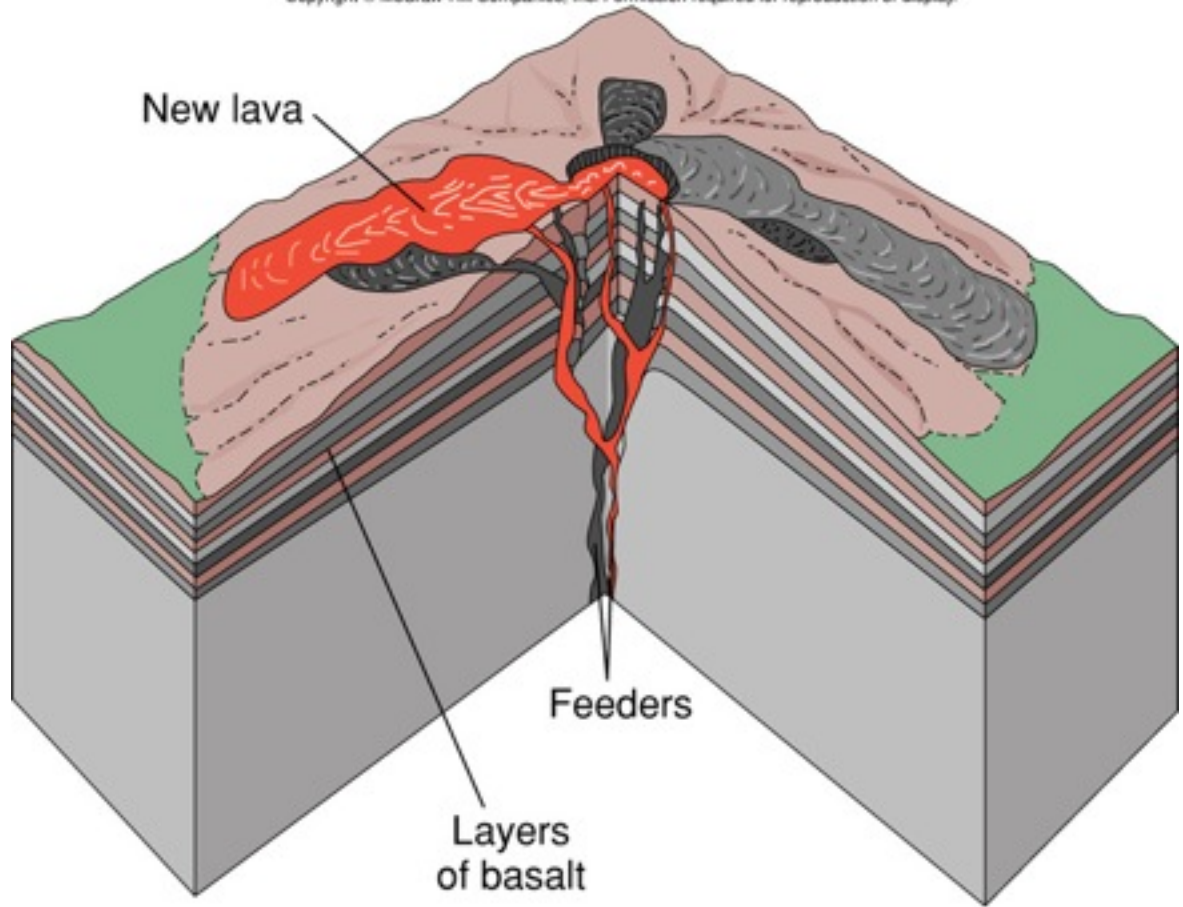
IGNEOUS
Plutonic



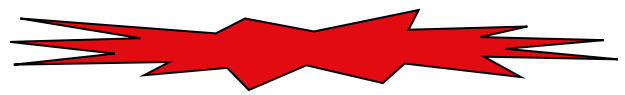
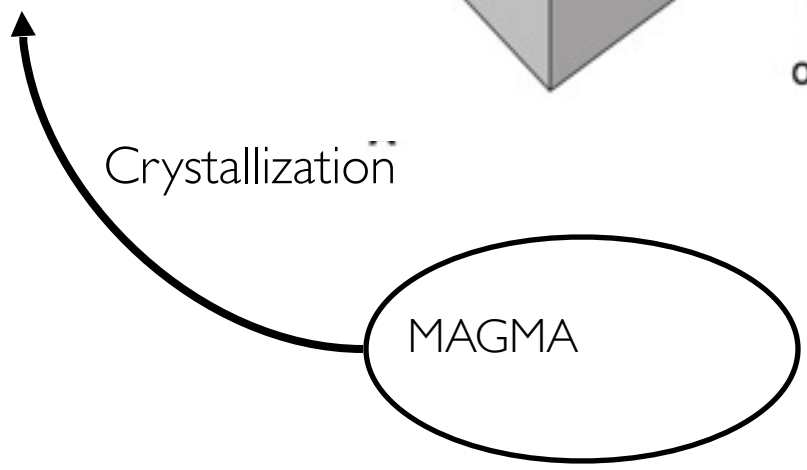
Crystallization

MAGMA

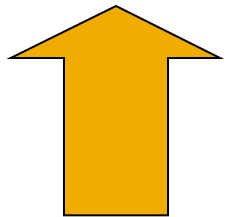
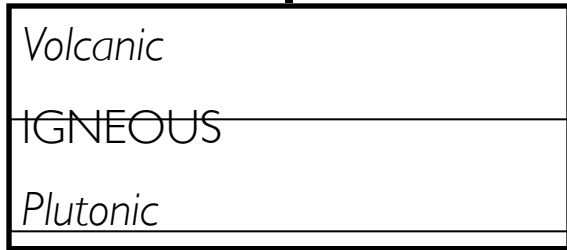
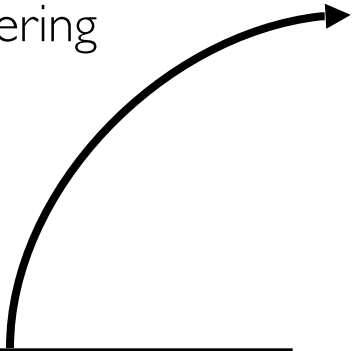




<i>Volcanic</i>
IGNEOUS
<i>Plutonic</i>

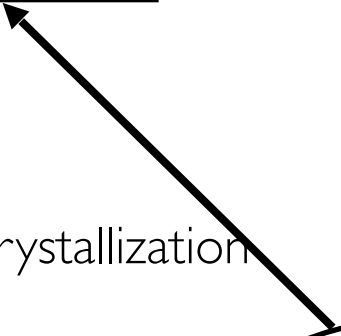


Weathering

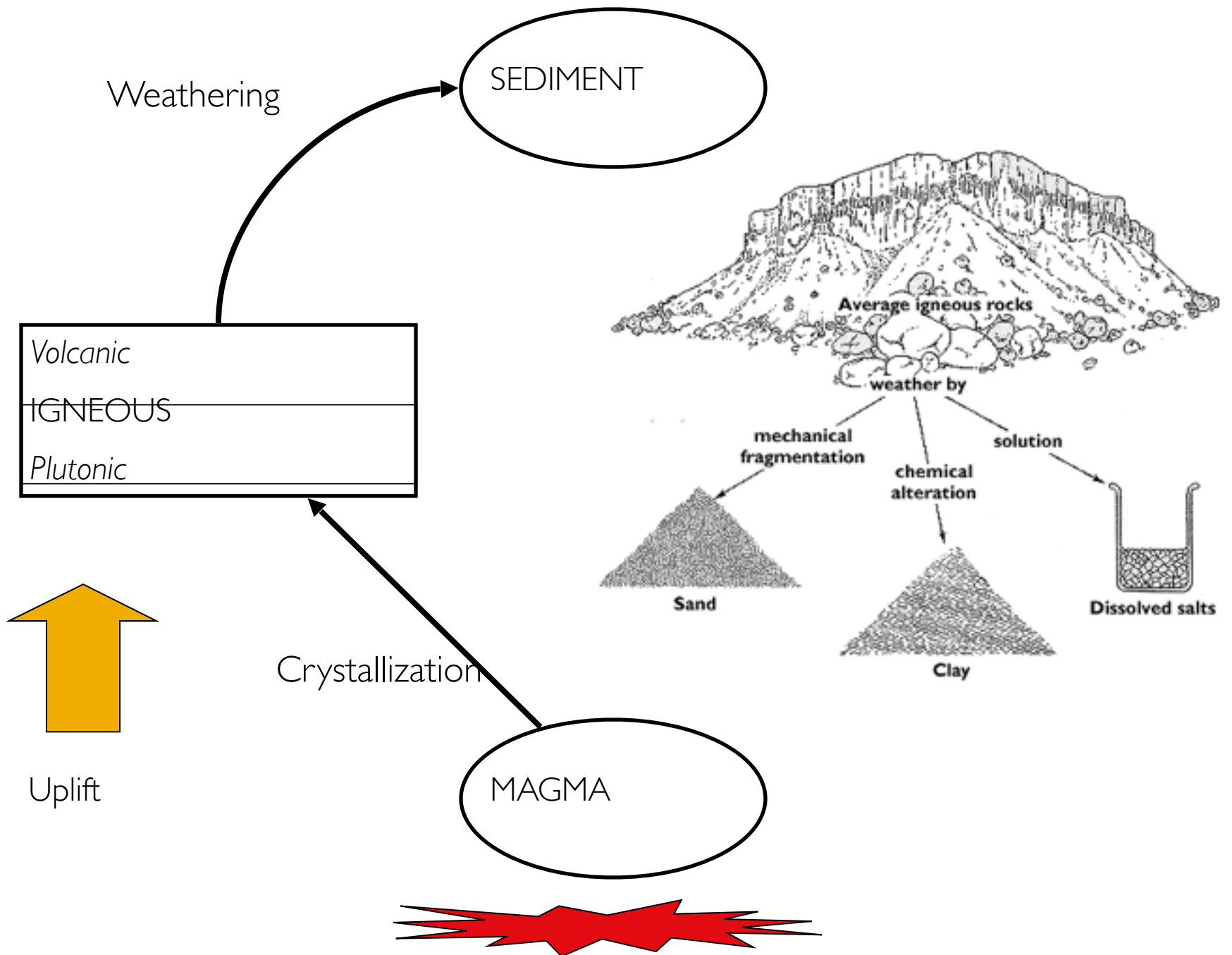


Uplift

Crystallization



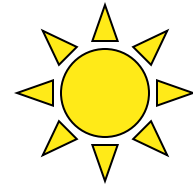
MAGMA



SEDIMENT

Weathering

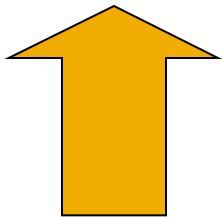
Erosion



Transport

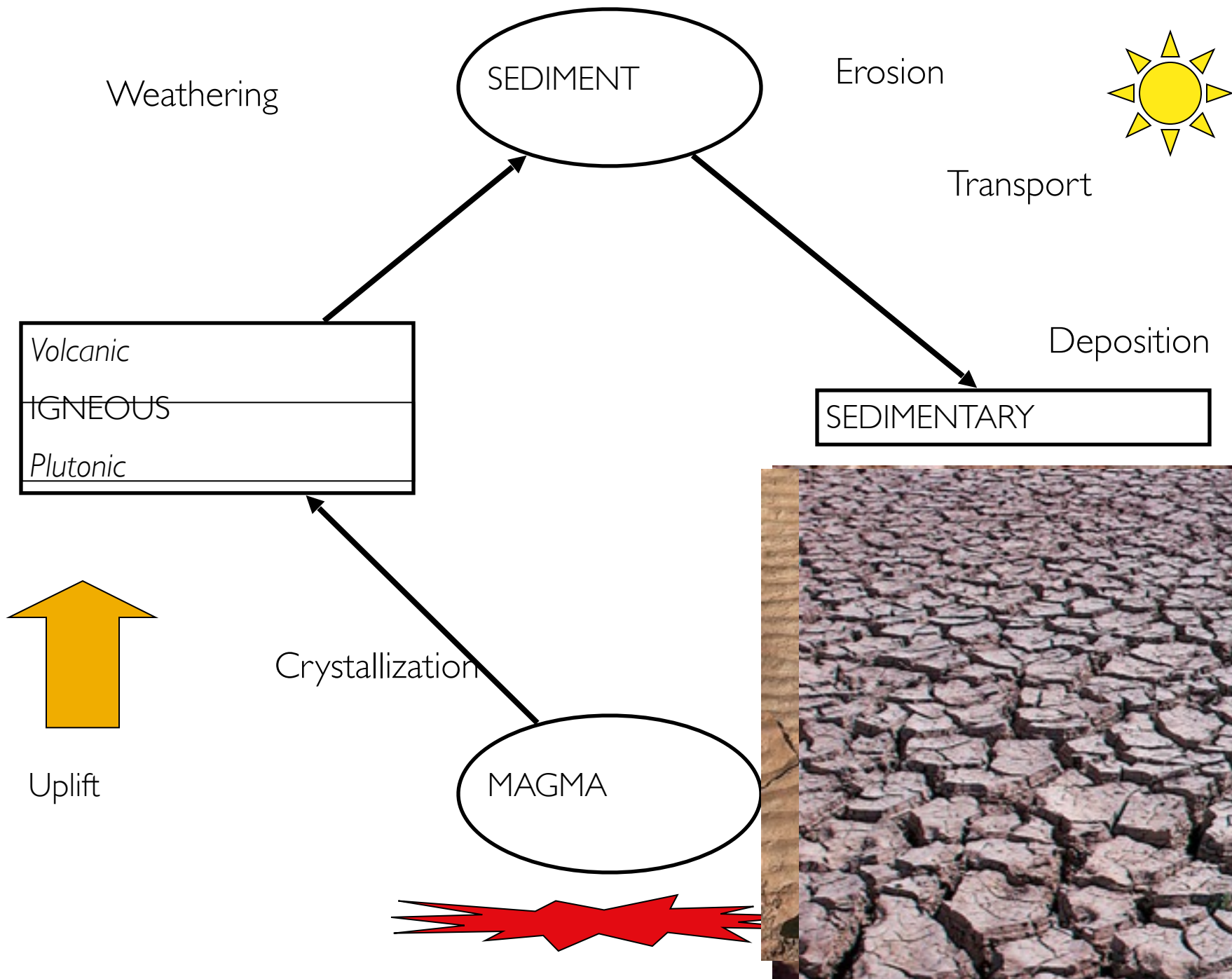
Deposition

Volcanic
IGNEOUS
Plutonic



Uplift

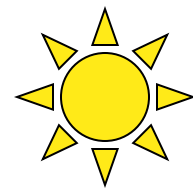
Crystallization



Weathering

SEDIMENT

Erosion



Transport

Deposition

Volcanic

IGNEOUS

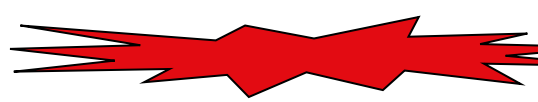
Plutonic

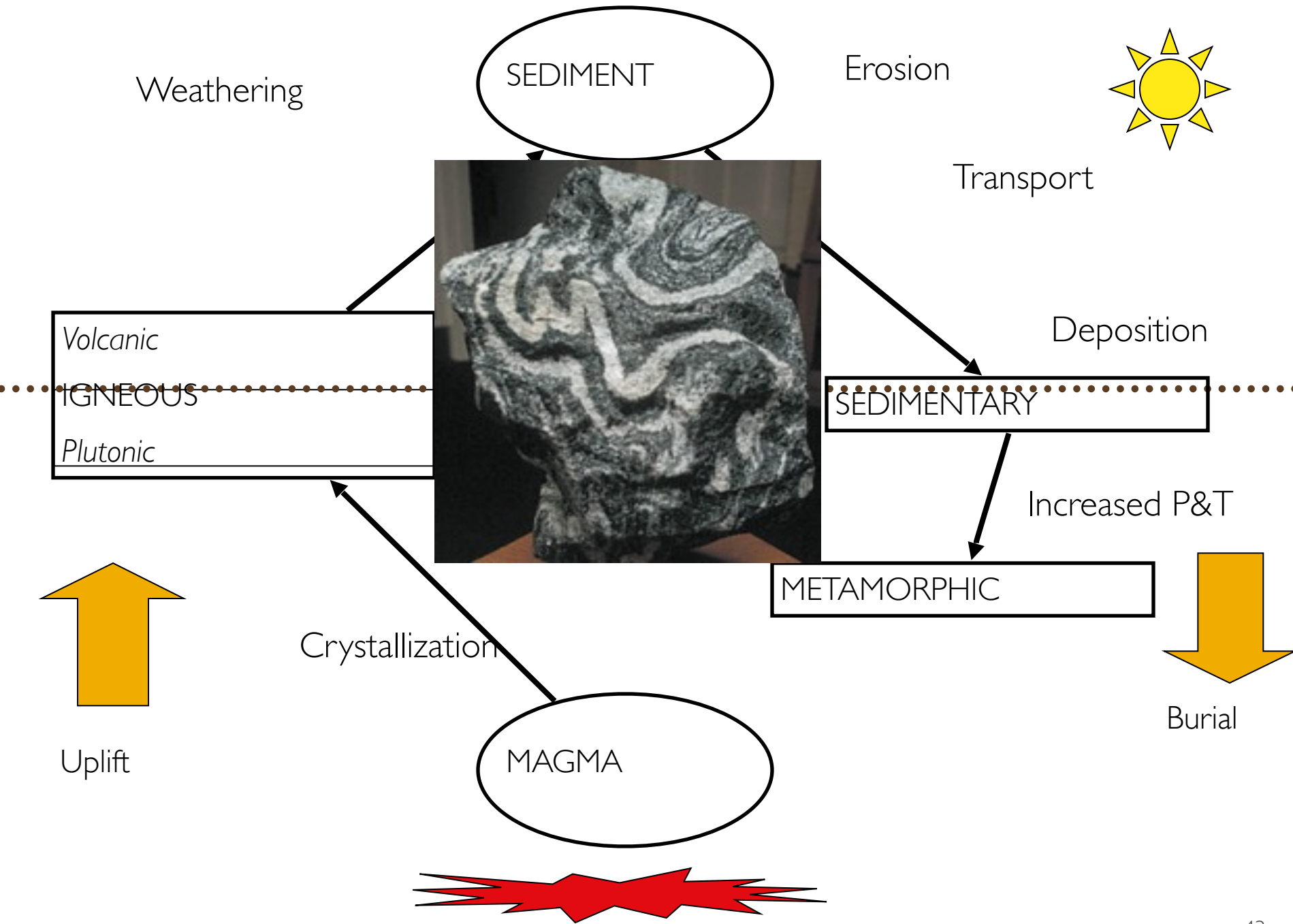
SEDIMENTARY

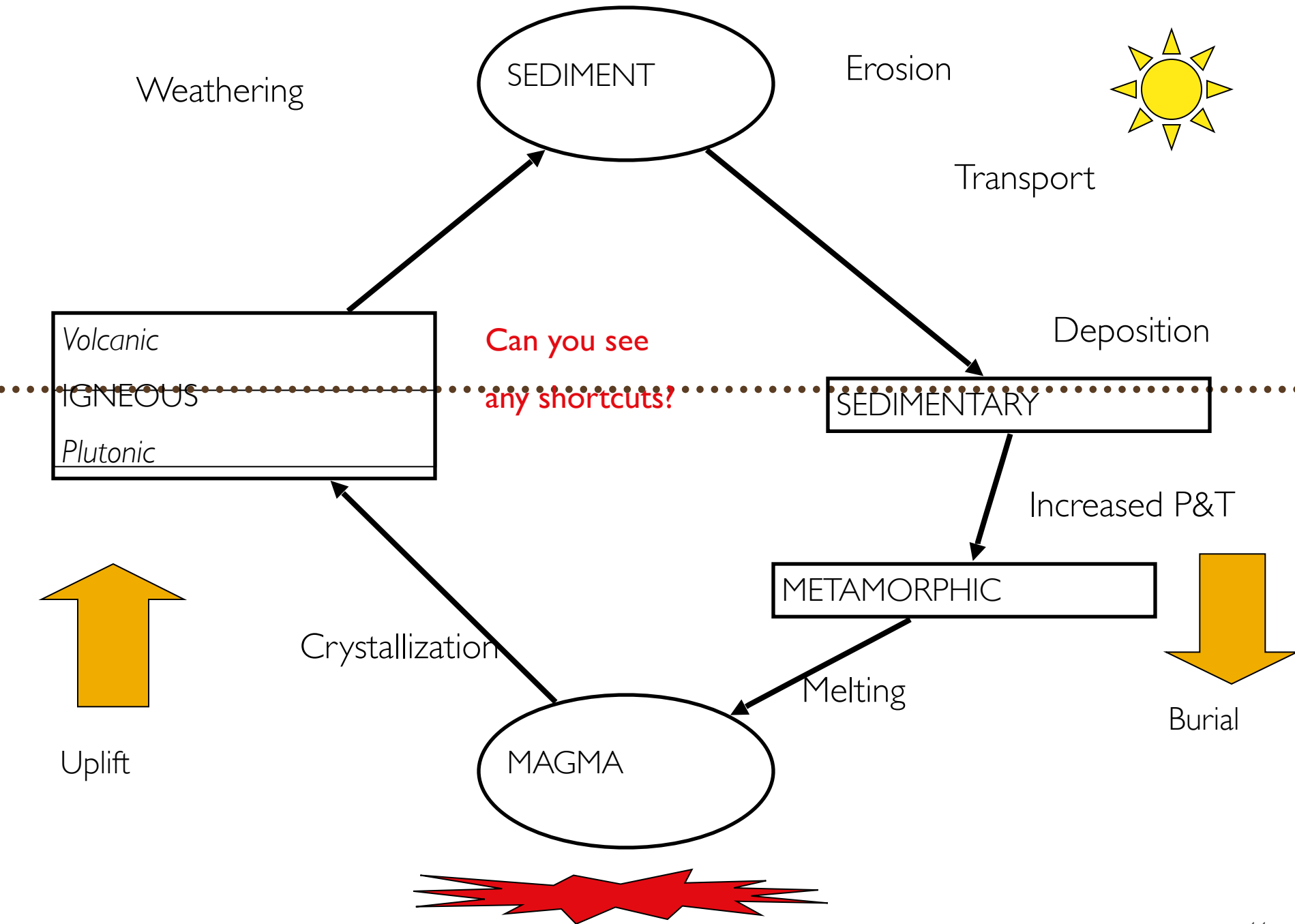
Crystallization

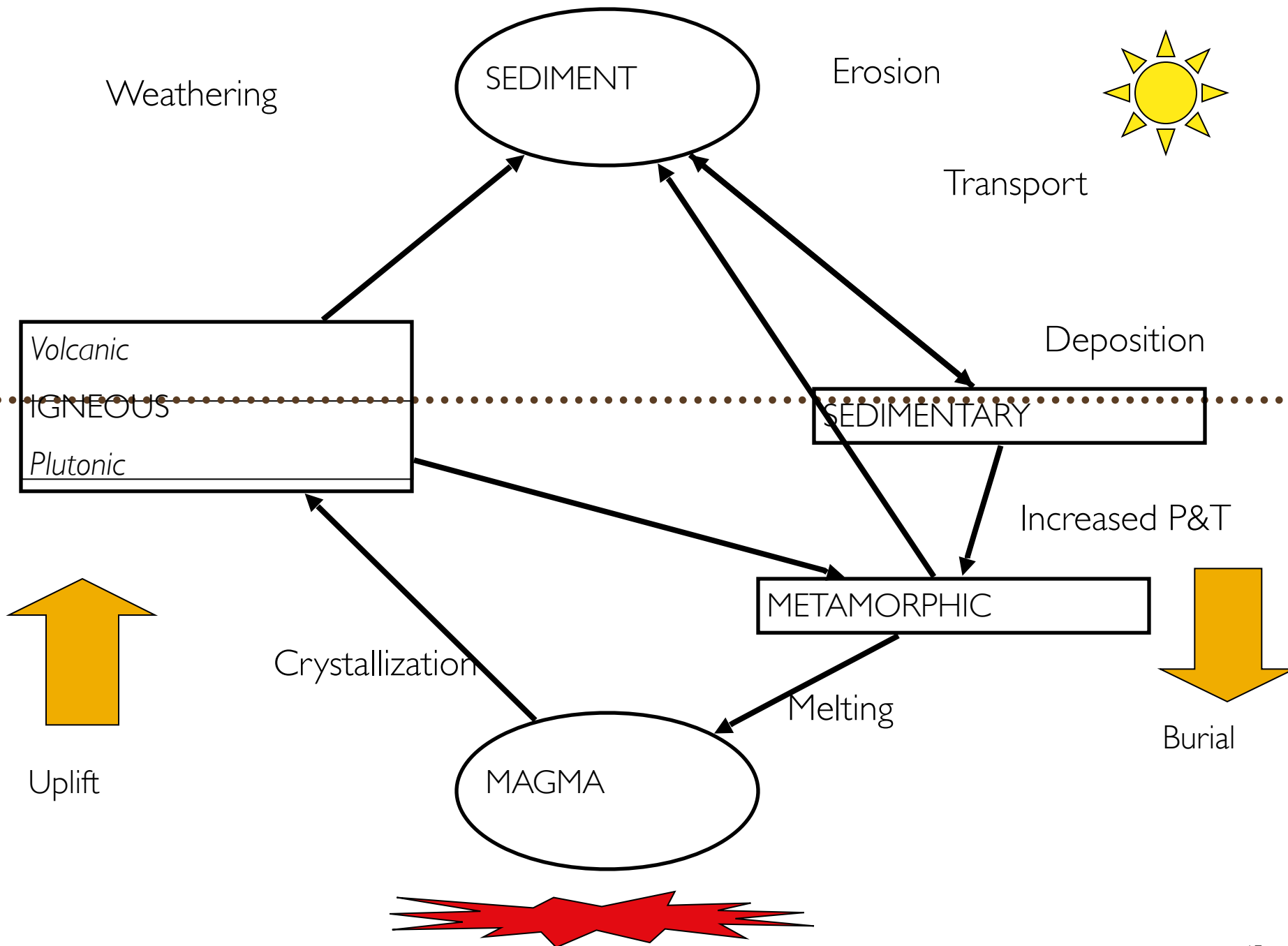
MAGMA

Uplift

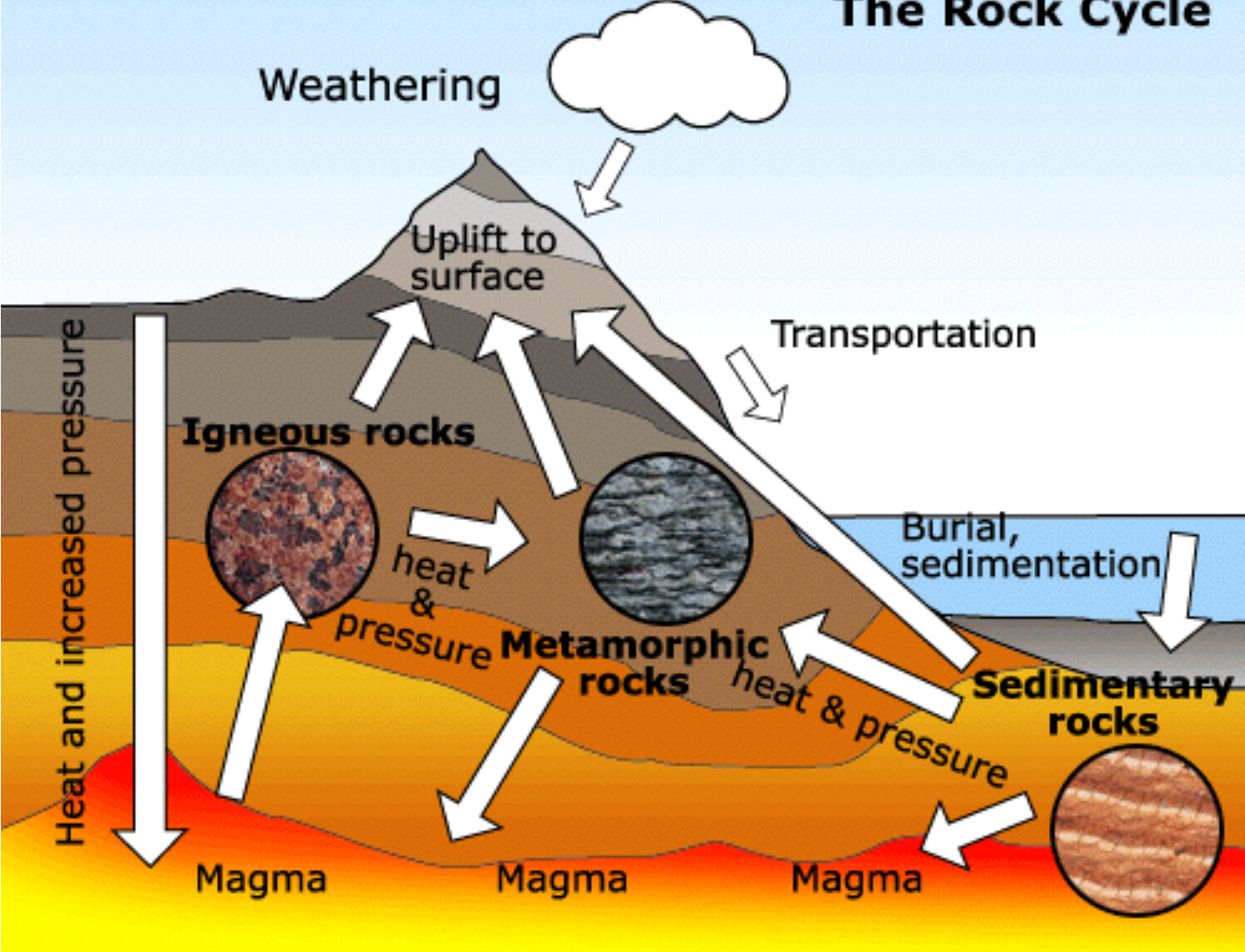




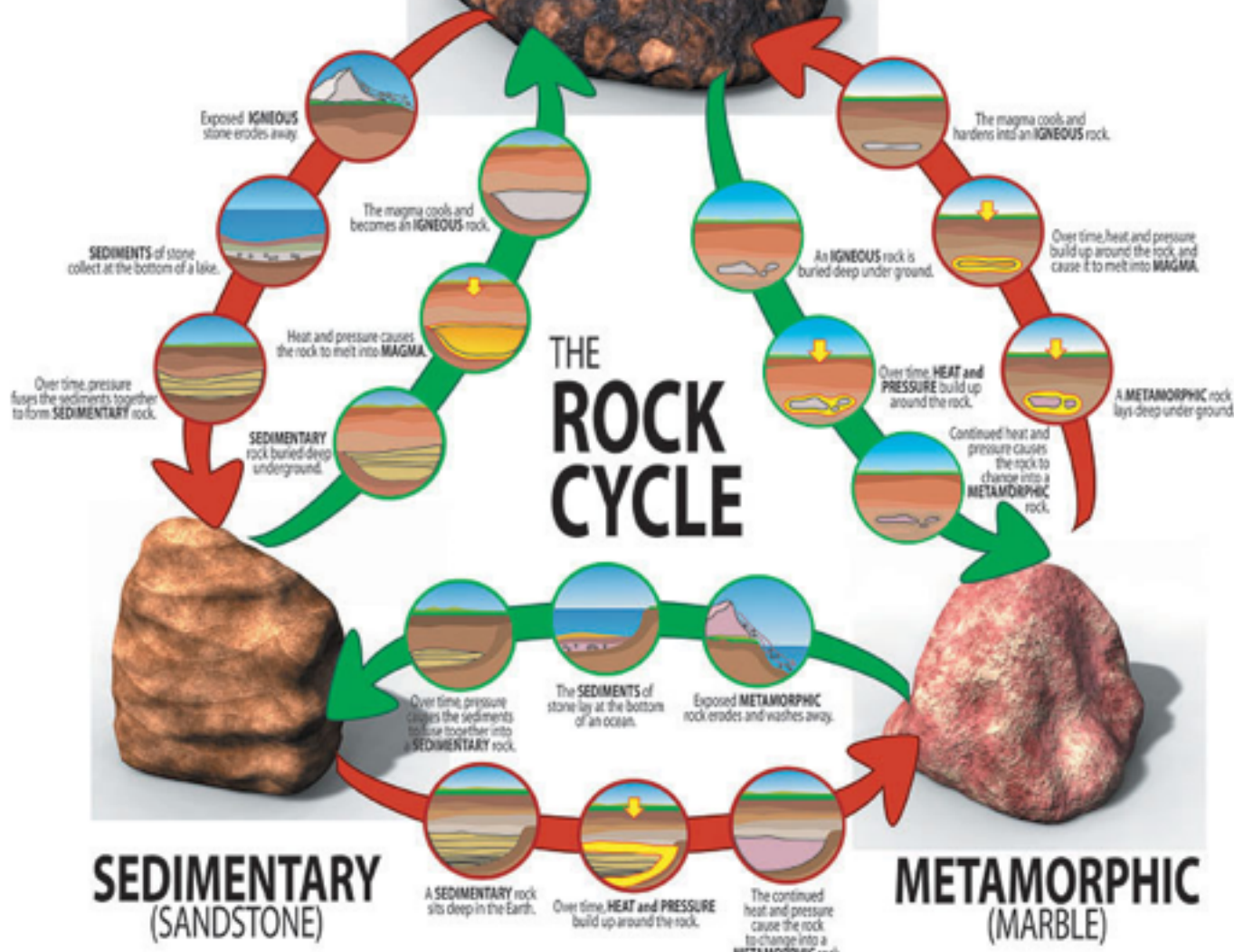




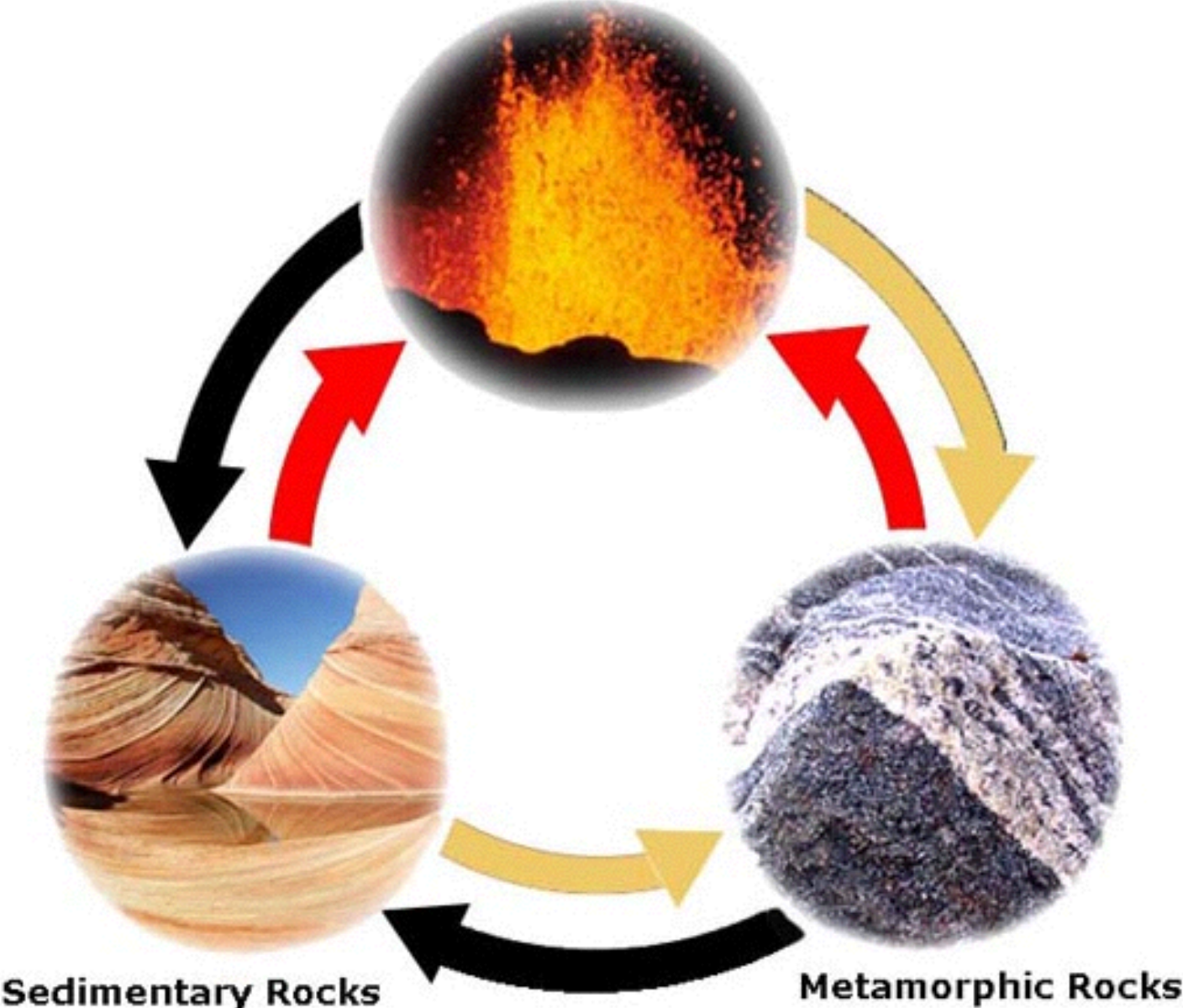
The Rock Cycle



IGNEOUS (BASALT)



Igneous Rocks



Sedimentary Rocks

Metamorphic Rocks

Then again, there are other ways of changing the shapes of rocks....

CHUCK NORRIS WAS HERE



The Grand Canyon continues to be weathered by the action of the small grains of rock that are carried along by the Colorado River.

- Basalt (an igneous rock) is the most common rock found on Earth.
- Each year, up to 100,000 tons of rock fall to the earth from space!
- 70% of all the rocks on earth are sedimentary.

- What is a rock's favorite ice cream? (Answer: Rocky road.)
- How do rocks wash their clothes? (Answer: On the rock cycle.)
- What do you do to a baby rock? (Answer: Rock it.)

How to Identify Rocks

- Rock types have some common characteristics.
- Igneous rocks are often shiny, crystalline, or porous.
- Sedimentary rocks often have layers, contain fossils, grainy, sandy, striped/layered, or made of many different pieces of rocks or minerals.
- Metamorphic rocks have some stripes or may not. The look depends on the heat and pressure applied to the rock. The more heat and pressure, the more striped it will look.

Certain Rocks Rock

Match the rock with its type:

Granite
Basalt
Shale
Gneiss
Sandstone
Coal
Slate
Phyllite
Schist
Marble
Siltstone
Conglomerate
Quartzite

