The Rock Cycle

Thinking about relationships among the major rock groups

Major Rock Groups

- Igneous
  - Formed from molten rock (magma/lava) that has cooled
  - Literally means “from fire”

1. Extrusive igneous rock is formed from lava (on earth’s surface) and tends to solidify quickly.
2. Intrusive igneous rock is formed from magma (inside the earth) and tends to take a long time to solidify into rock.


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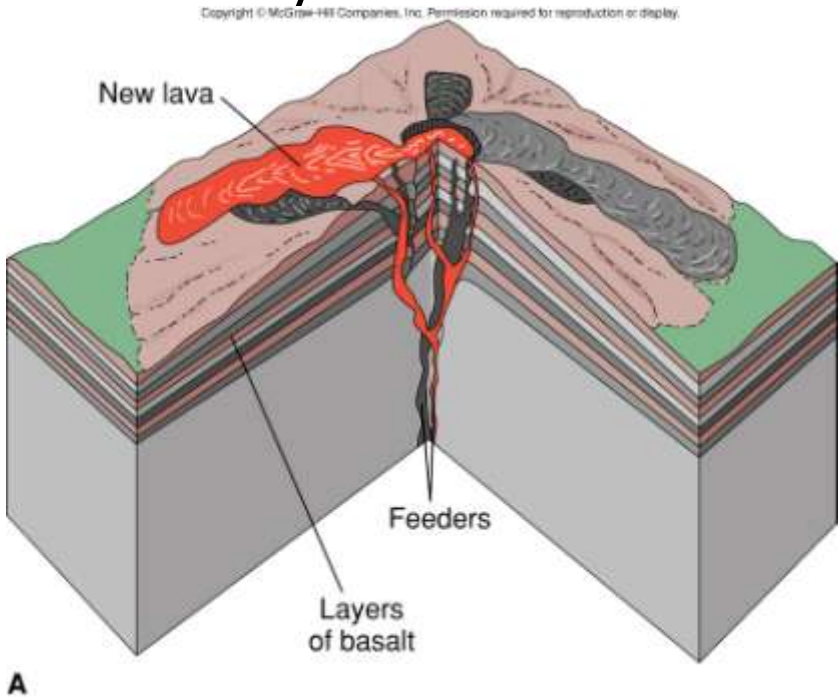
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Major Rock Groups

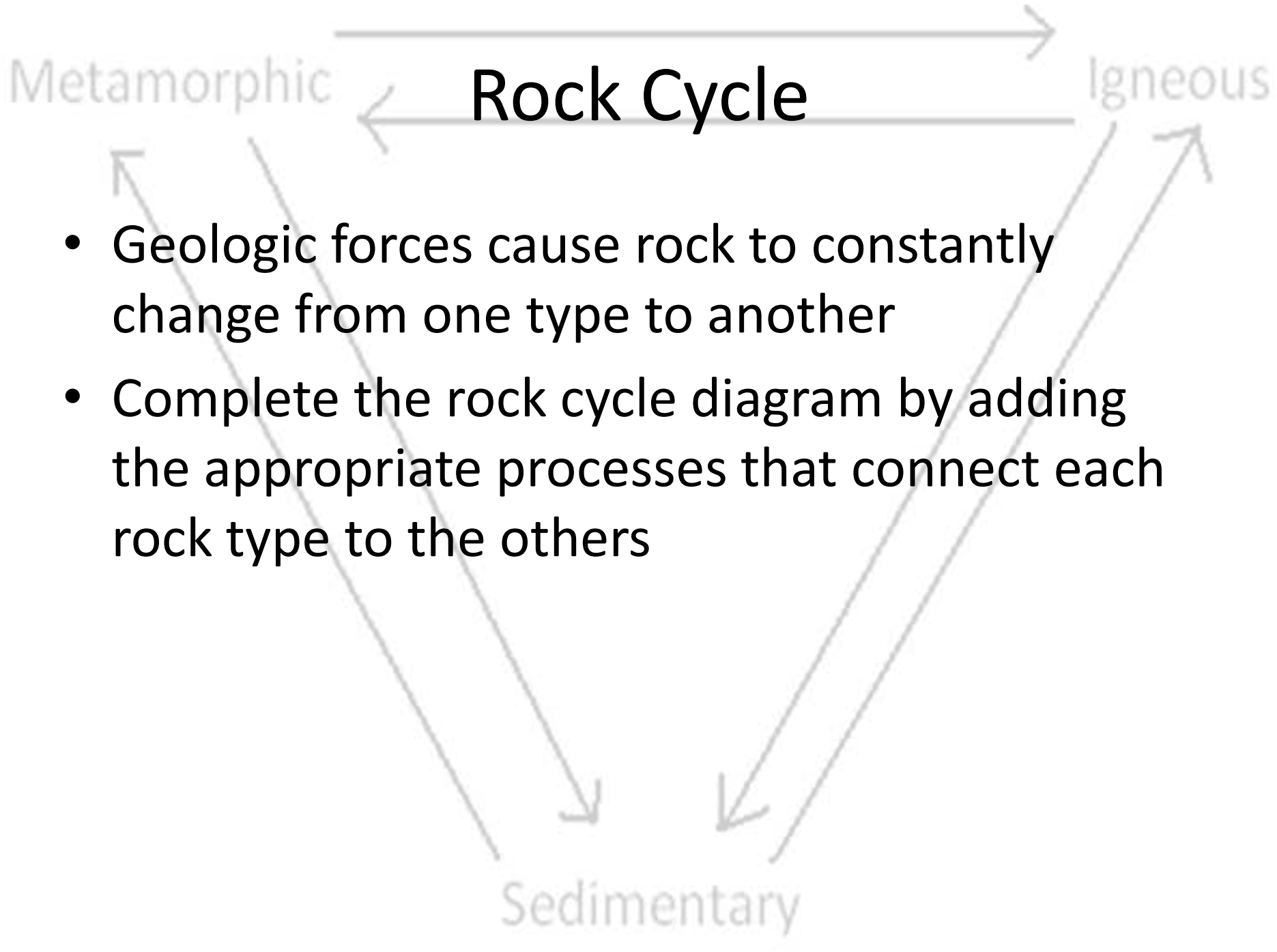
- Sedimentary
  - **All types of rock are continuously being broken down into small fragments called sediment.**
  - **This sediment can be <u>compressed</u> or <u>cemented</u> together to form sedimentary rock**

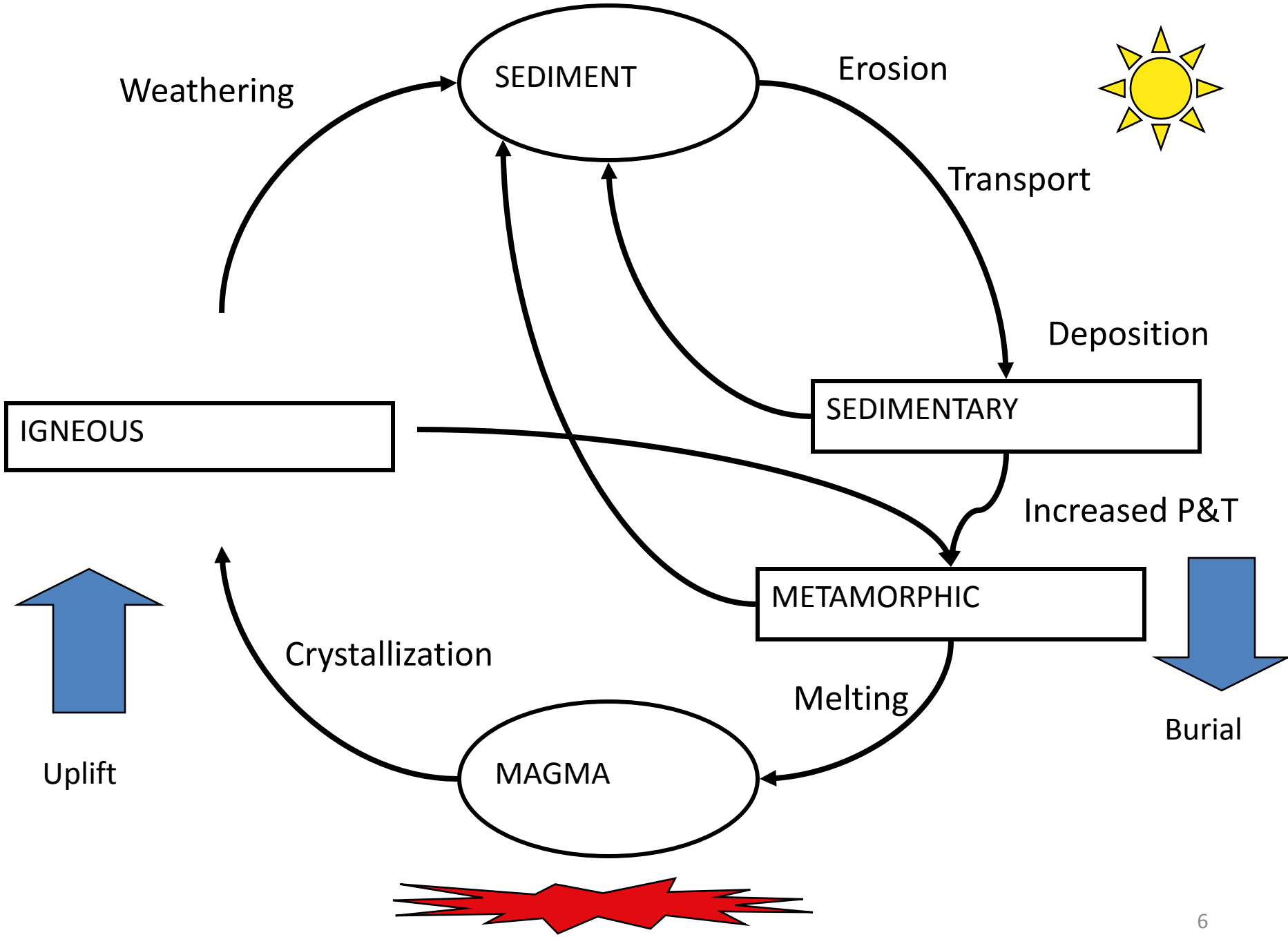
Major Rock Groups

- Metamorphic
- Processes such as extreme heat/pressure can alter the chemical composition of the original rock to form a new rock.

Rock Cycle

- Geologic forces cause rock to constantly change from one type to another
- Complete the rock cycle diagram by adding the appropriate processes that connect each rock type to the others



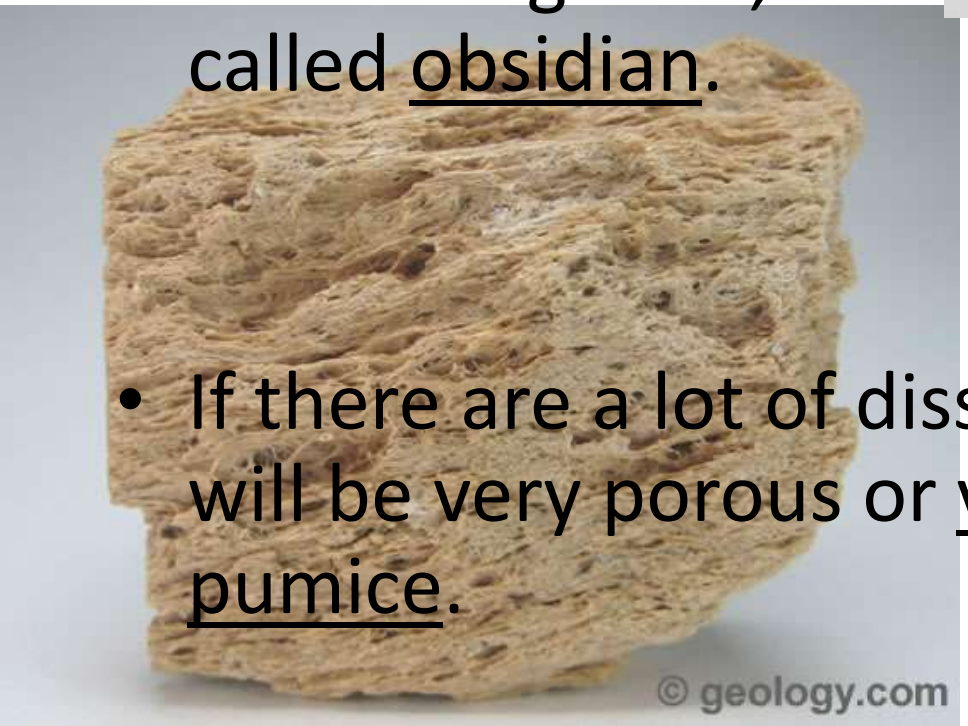

SEDIMENT
Weathering
Erosion
Transport
Deposition
SEDIMENTARY
IGNEOUS
Increased P&T
METAMORPHIC
Crystallization
Melting
Uplift
Burial
MAGMA

Crystal Formation

- As magma cools, minerals that have been melted tend to solidify into specific shapes called crystals. Since extrusive igneous tend to solidify more quickly, the crystals tend to be small or fine grained.
- Examples: Basalt and Rhyolite

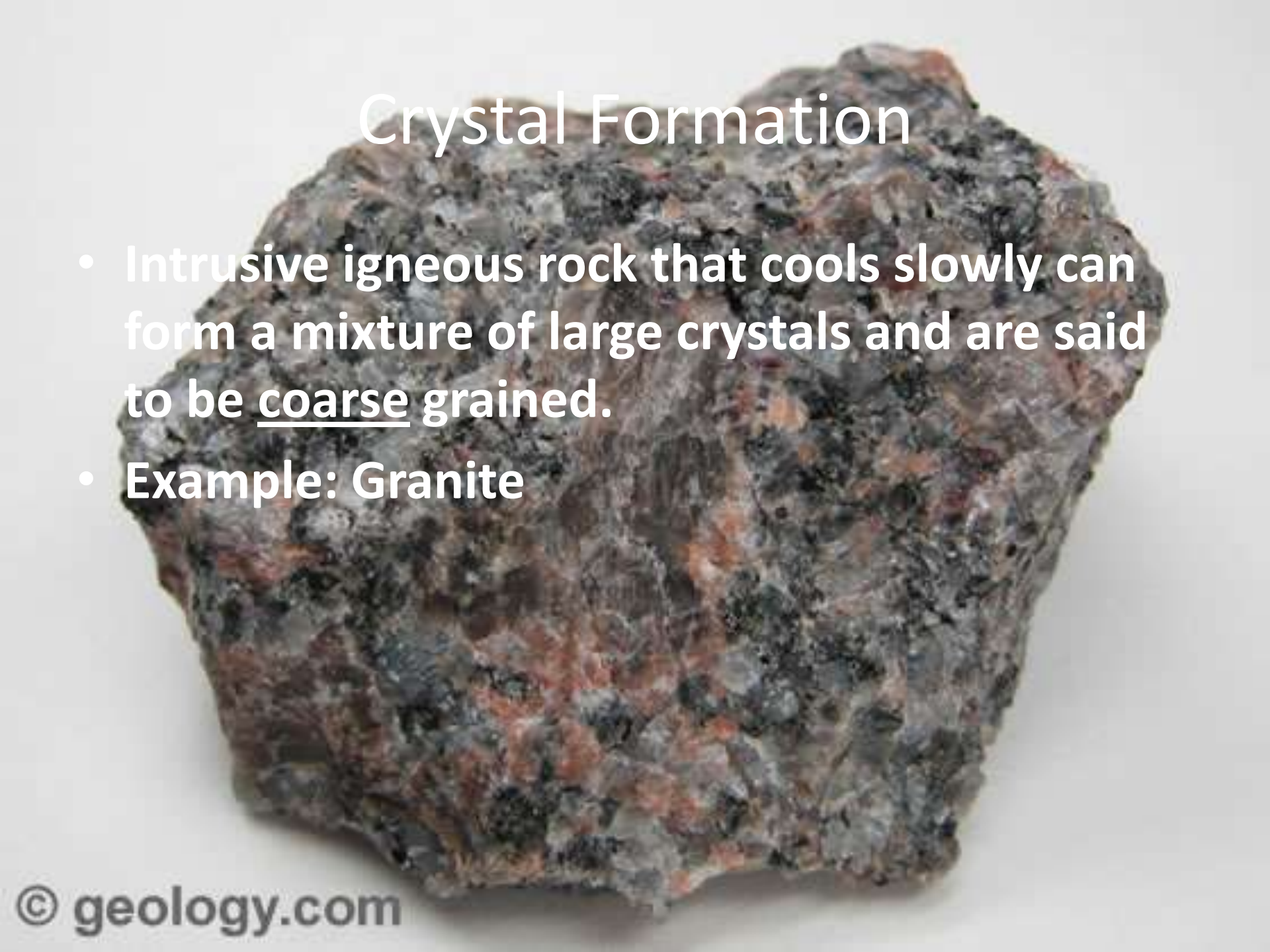
Crystal Formation

- Some extrusive igneous rocks cool so quickly that crystals are not formed at all.
- If this happens and the lava has very little dissolved gasses, the rock will be a glassy rock called obsidian.



- If there are a lot of dissolved gasses the rock will be very porous or vesicular and be called pumice.

Crystal Formation



- **Intrusive igneous rock that cools slowly can form a mixture of large crystals and are said to be coarse grained.**
- **Example: Granite**

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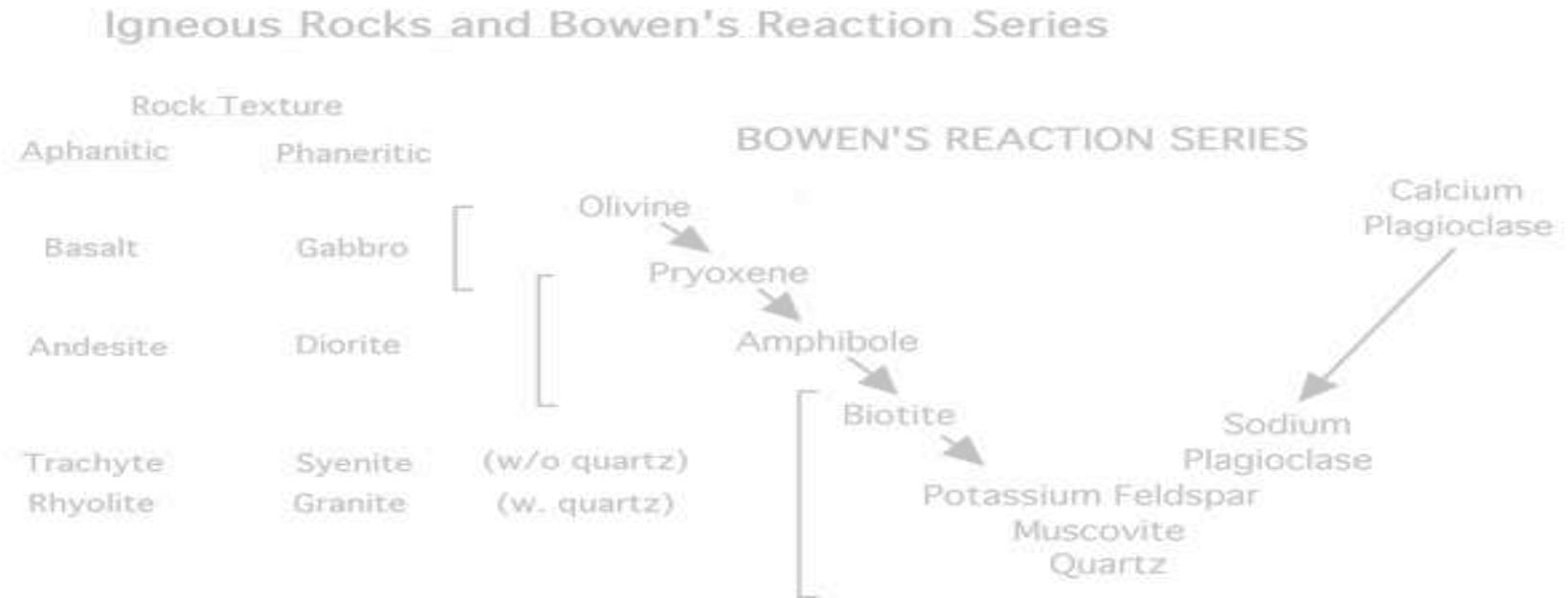
Bowens Reaction

- **N. L. Bowen studied mineral crystallization and found out that minerals form at specific <u>times</u> during that solidification process and they generally form in the <u>same</u> <u>order</u>.**



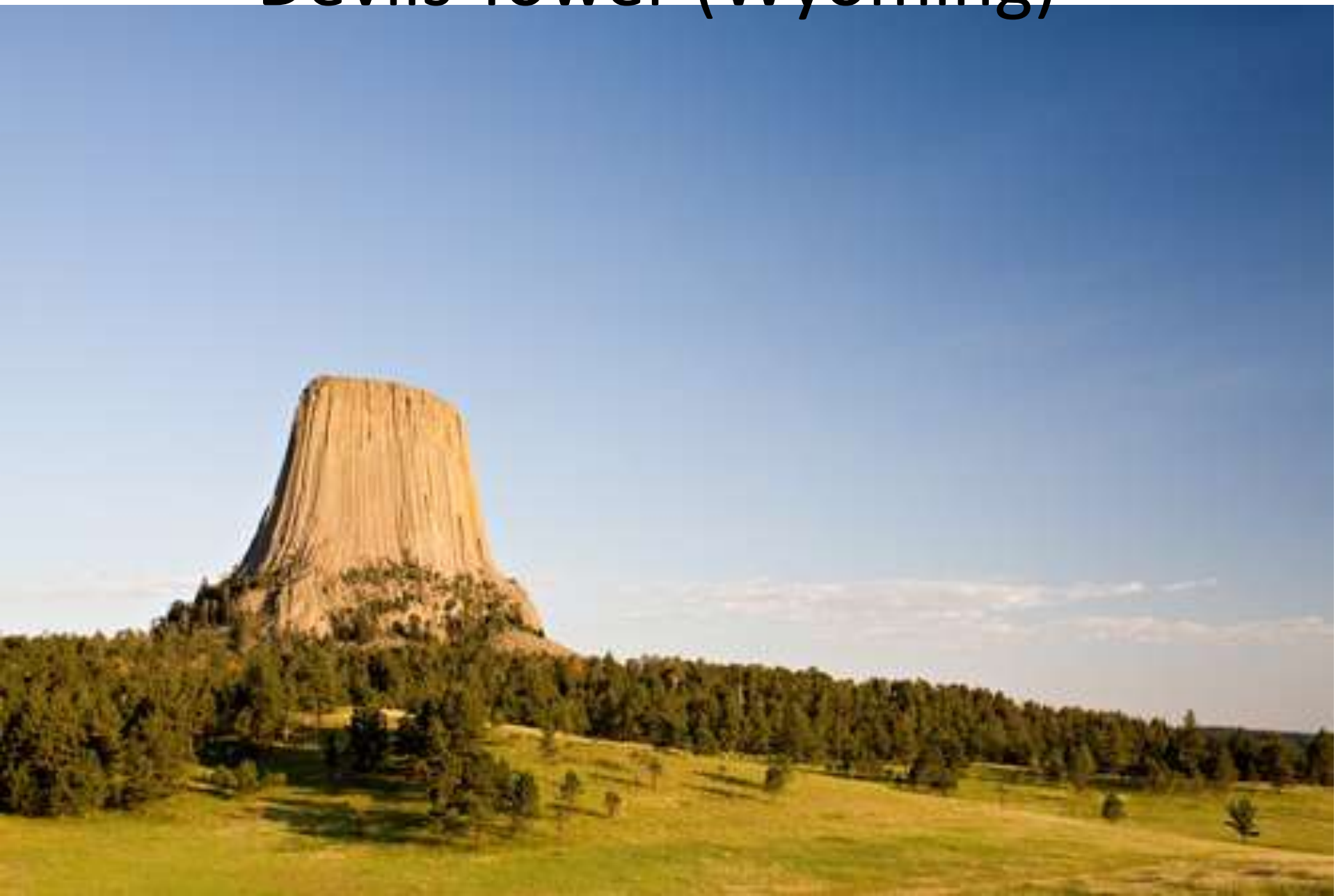
Composition of Igneous Rock

- **Felsic rock: generally light colored and contains a high concentration of silica**
- **Mafic rock: generally dark colored and contains a low concentration of silica**

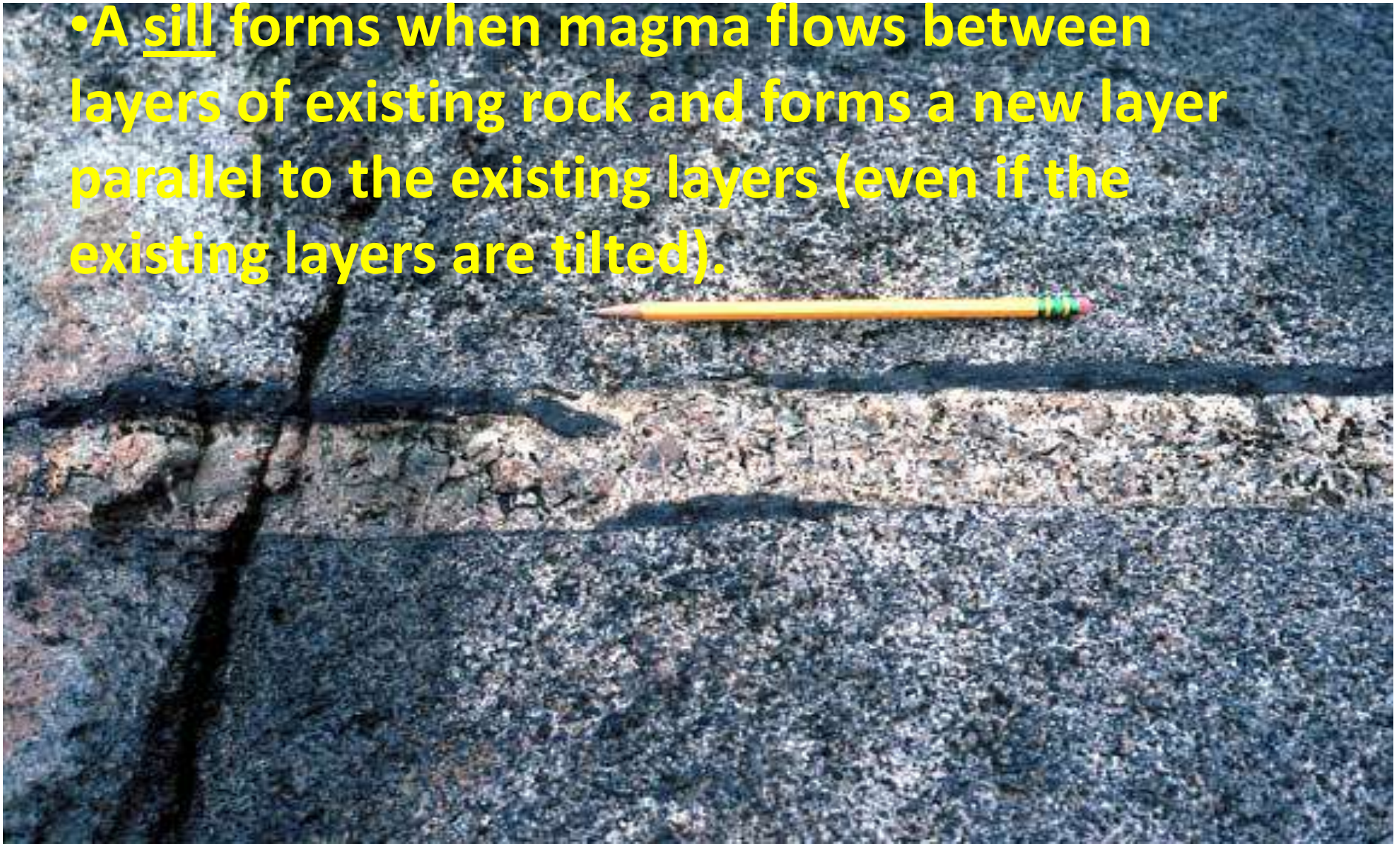
Intrusive Rock Structures

- Volcanic Neck: Magma that solidifies in the main vent of a volcano is much harder than the surrounding rock.
- Eventually the surrounding rock is eroded leaving the harder intrusive igneous rock exposed.

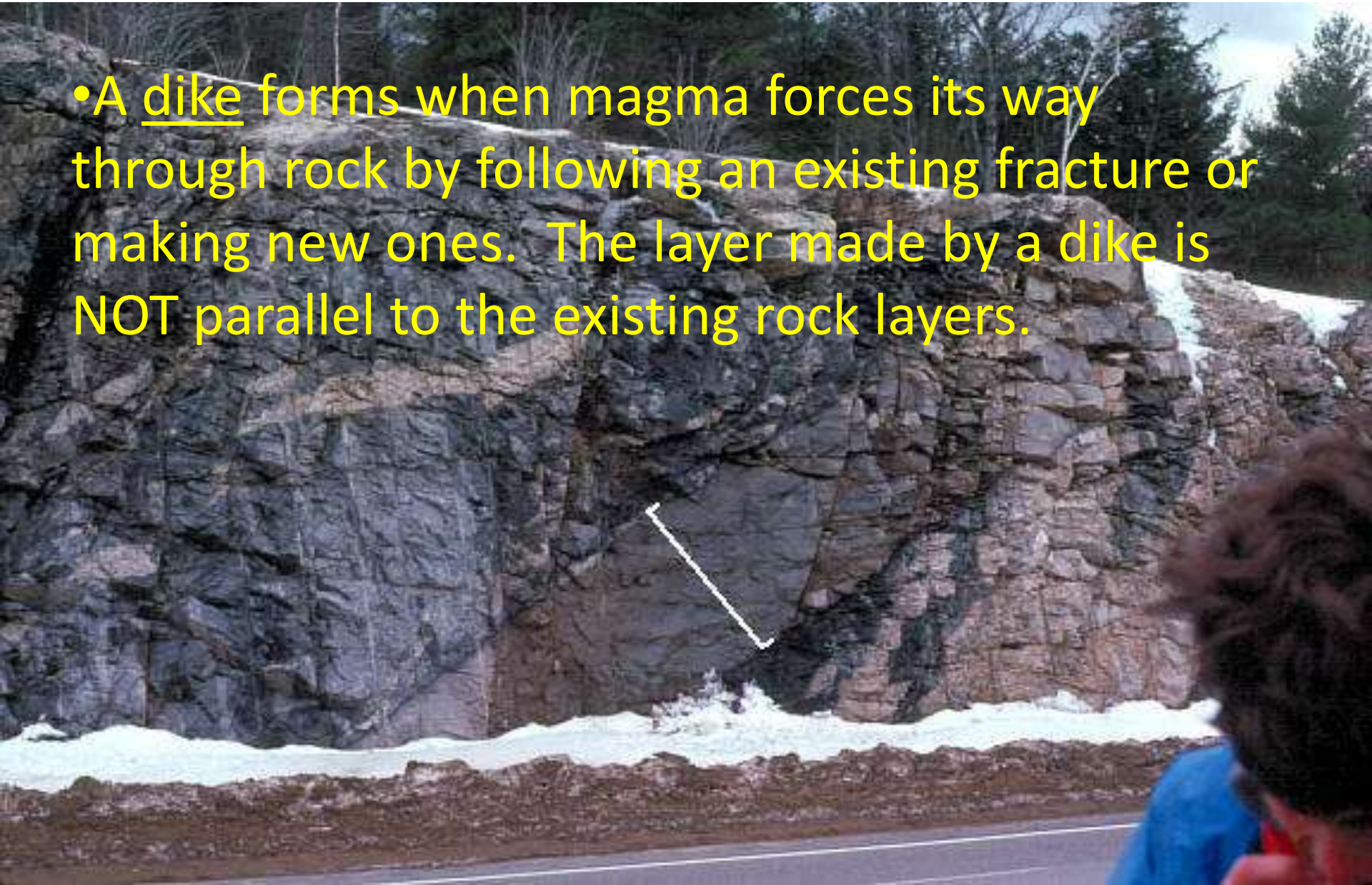
Devils Tower (Wyoming)



Intrusive Rock Structures



Intrusive Rock Structures

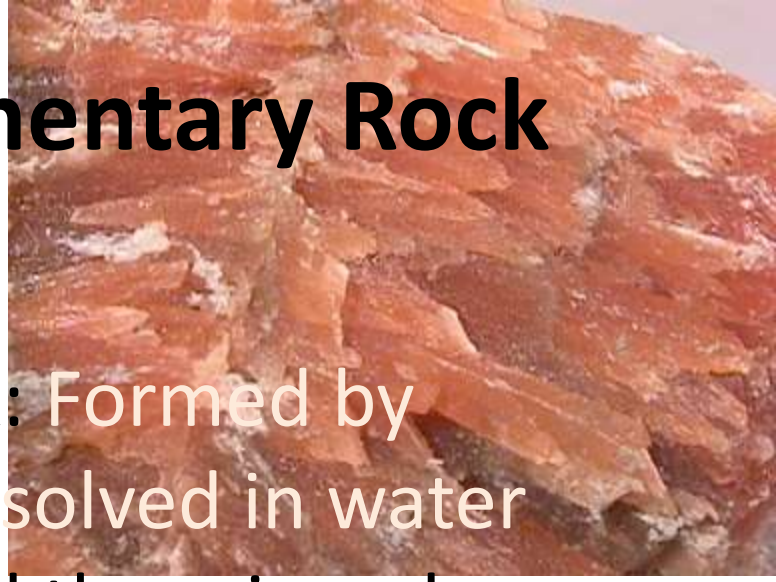


- A dike forms when magma forces its way through rock by following an existing fracture or making new ones. The layer made by a dike is NOT parallel to the existing rock layers.

Formation of Sedimentary Rock

- Compaction: is when pieces of sediment are squeezed together by the weight of overlying layers (including water)
- Cementation of sediment occurs when minerals are deposited in a bed of sediment and as the water evaporates the dissolved minerals form crystals that "glue" the sediment particles to each other.

Three Types of Sedimentary Rock



- Chemical Sedimentary Rock: Formed by minerals that were once dissolved in water but as the water evaporated the minerals formed rocks called <u>evaporates</u>.
- Examples include <u>gypsum</u> (drywall) or halite (rock salt). The Bonneville salt flats were formed this way.

Three Types of Sedimentary Rock

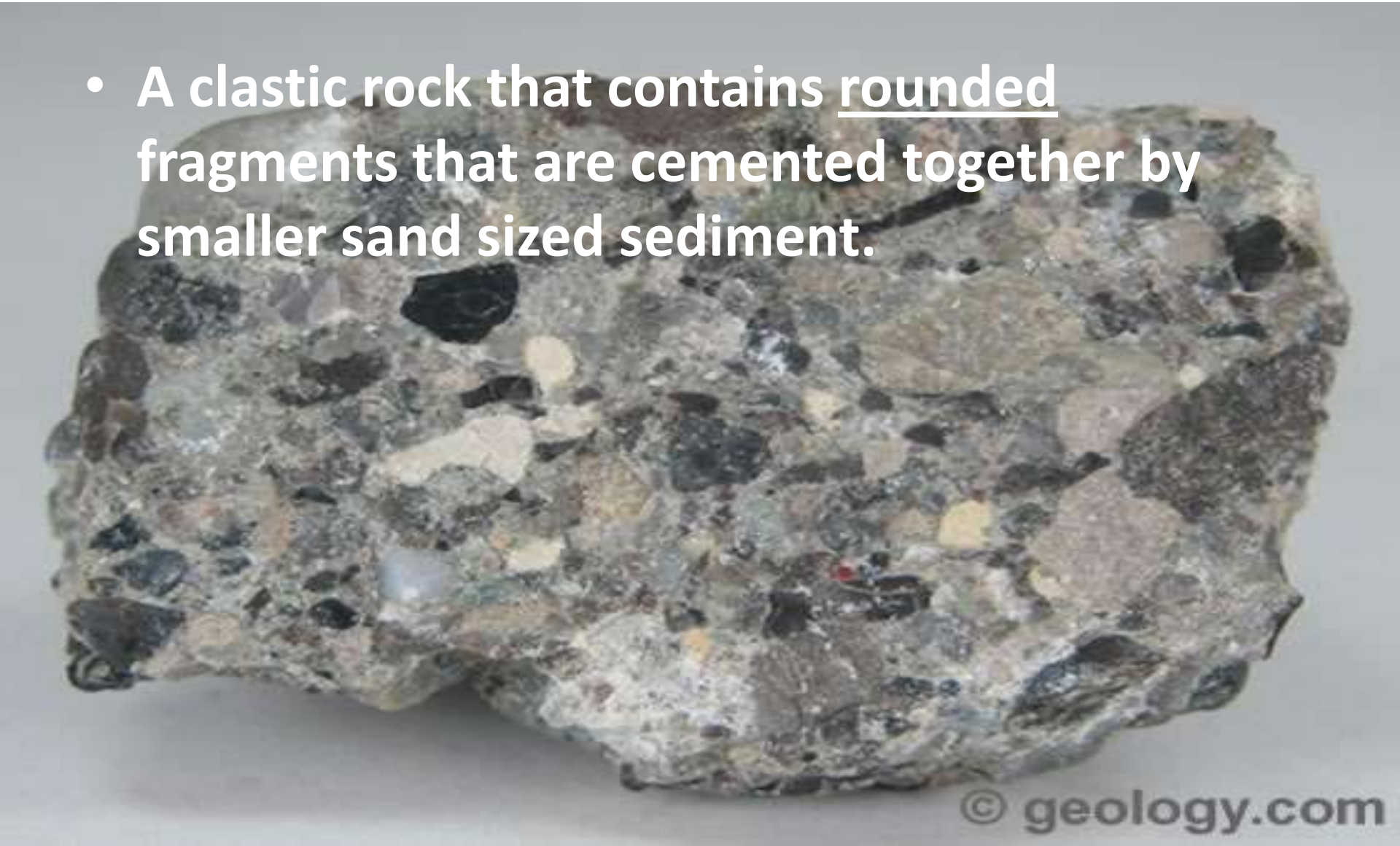
- Organic Sedimentary Rock: The remains of living organisms can sometimes form rocks such as coal or limestone.
- Coal is partially decayed plant and animal material while limestone is made entirely of $CaCO_3$ (Calcium Carbonate) shells from dead organisms.

Three Types of Sedimentary Rock

- Clastic Sedimentary Rock: Made of rock fragments that are carried away from their source by water wind or ice and left as deposits. Over time these fragments become cemented/compacted together.

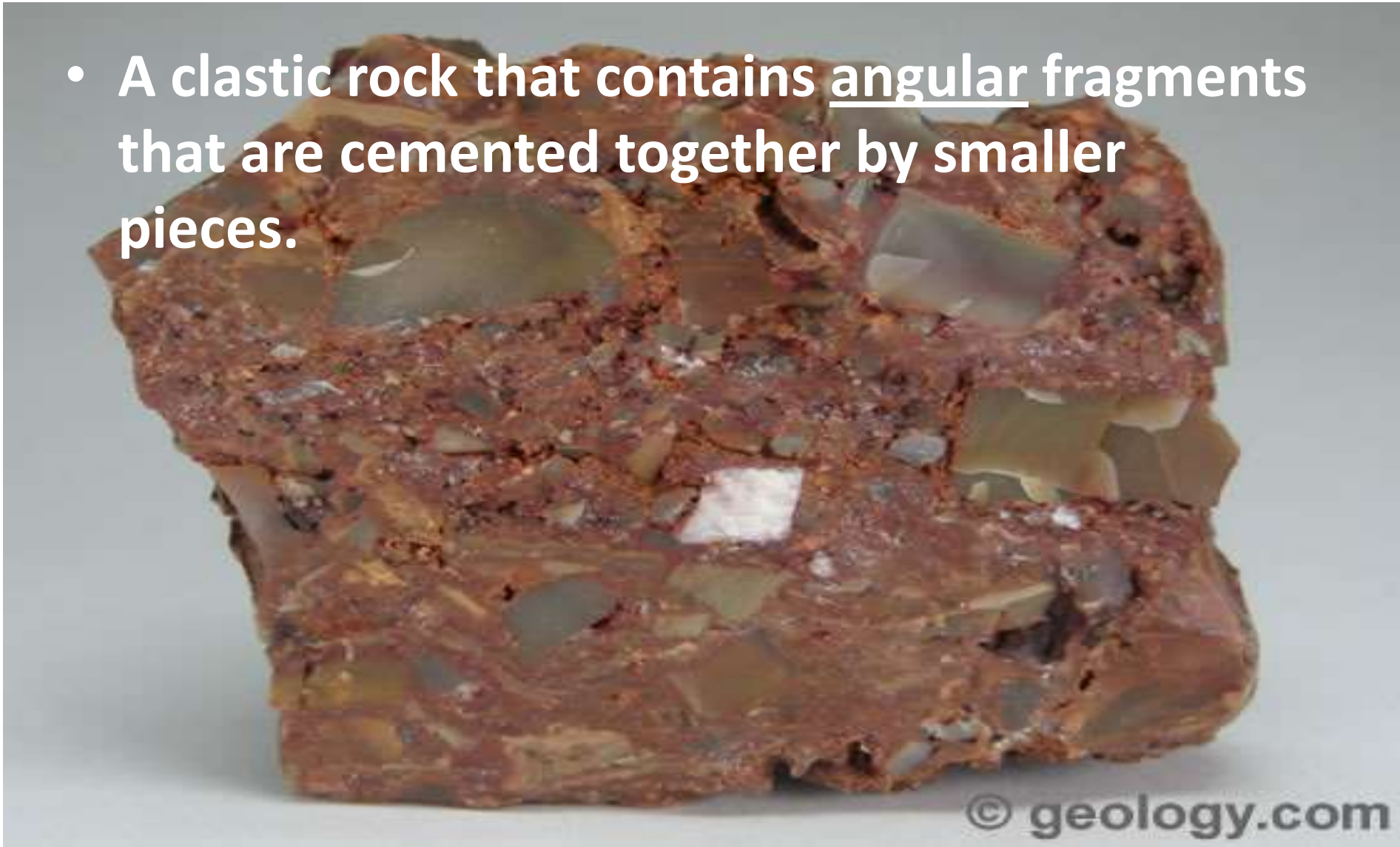
Conglomerate

- A clastic rock that contains rounded fragments that are cemented together by smaller sand sized sediment.



Breccia

- A clastic rock that contains angular fragments that are cemented together by smaller pieces.



Sandstone

- Contains uniformly small pieces of mineral grains that are cemented together.

Shale

- Composed of clay sized (smaller than sand grains) particles that are compressed into flat layers

Metamorphic Rocks

- Metamorphic rocks are formed from existing rock that is subjected to pressure and heat (but not melted) into a new type of rock.

Marble

- **Marble** is formed when limestone is subjected to heat and pressure.

Slate

- **Slate** is formed from shale.

Quartzite

- **Quartzite** is formed from sandstone.

Diamonds

- Diamonds are formed from <u>Coal</u>