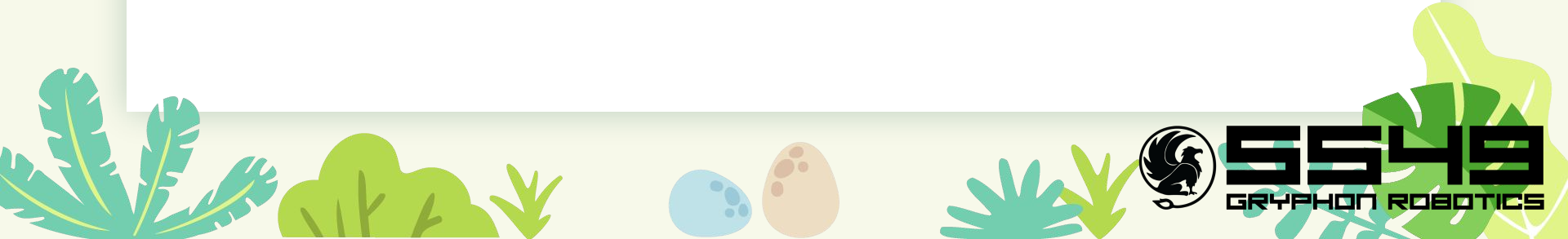


Geology Basics

Erosion, Fossils, Rocks, Geysers



5549
GRYPHON ROBOTICS

Paleontology

Petroleum

Volcanology

Geologist

Geology is the study of the Earth, the materials of which it is made, the structure of those materials, and the processes acting upon them. It includes the study of organisms that have inhabited our planet. An important part of geology is the study of how Earth's materials, structures, processes and organisms have changed over time.

Marine

Mining

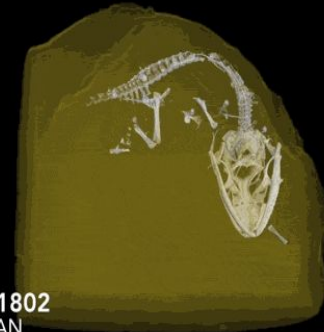
Planetary

Environmental

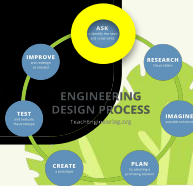


Example Need / Problem:

While on an expedition with a team of paleontologist you **discovered a portion of an unidentified fossilized remain!** Is it a full specimen? A partial specimen? Is it a new species? You can't tell yet until you uncover more. Your team will need to take your specimen back to their lab for further research but don't want to damage the remains by just digging randomly. How do you proceed?

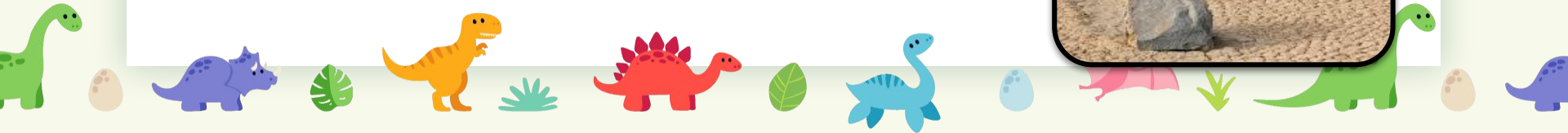


JZC BU1802
GEKKOTAN



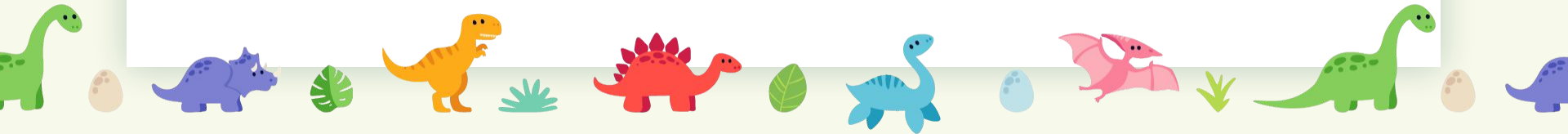


The Mystery of the Moving Rocks...

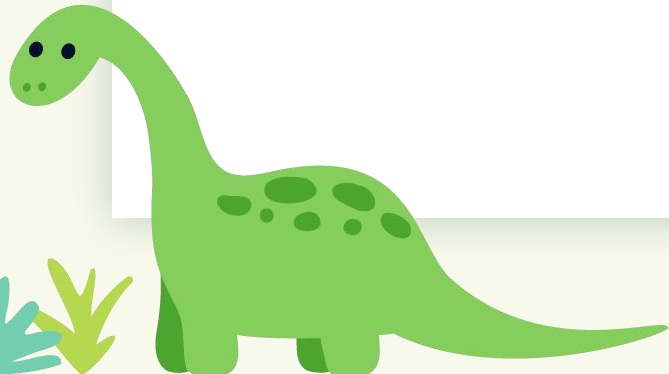




The Mystery of the Moving Rocks...



Erosion



Erosion

Materials:

- Deep pan or container
- Plastic/paper cup
- Scissors
- Water
- Sand or Soil
- Ice cubes (optional)
- Straw (optional)
- Gloves (optional)

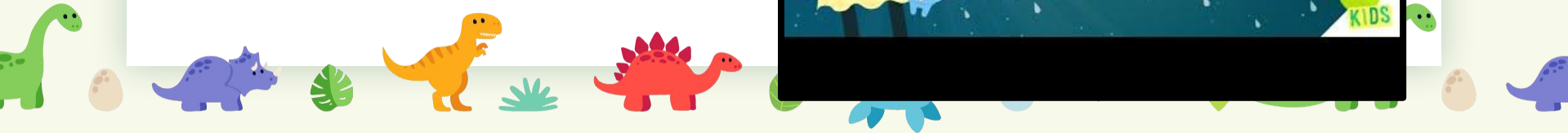
What is Erosion? Why is it important? Is it good or bad?





What is Erosion?

Erosion is a **geological process** in which parts of the earth are worn away or moved by natural forces. Most commonly moved by wind, water, or even ice. Erosion is powerful enough to change an entire landscape!



The good and the bad...

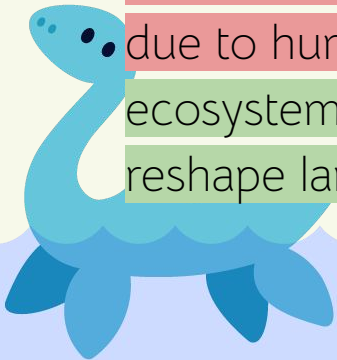
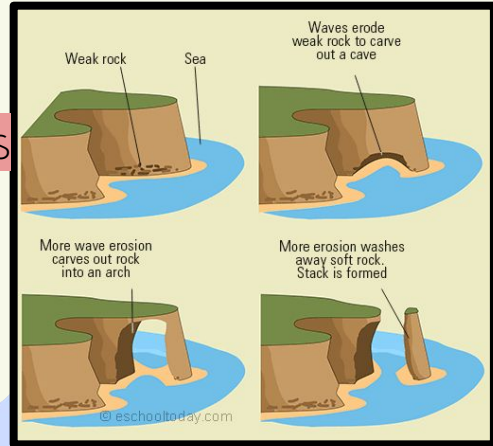
Erosion can cause many changes in an ecosystem, plant life could be unable to sustain life because nutrients were swept away, the soil washed away could be toxic, flash floods might occur more because of erosion.

However, erosion is also natural and has some benefits.

More nutrients may be delivered to plants that need them.

However this may lead to eutrophication and algae blooms

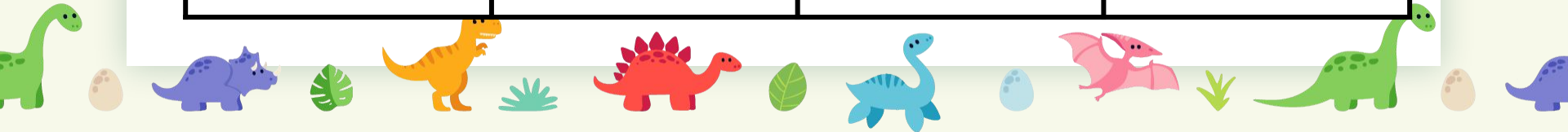
due to human activity. Erosion can also cleanse an ecosystem of unneeded materials. Erosion can also reshape landscape creating new habitats.





What are the Types of Erosion?

4 Main Types of Erosion			
Physical Erosion	Chemical Erosion	Water Erosion	Wind Erosion
This is when a landscape of rocks change their physical properties/ appearance because of constant beatings by forces	Chemical erosion occurs when rocks or landscapes change their chemical composition as they erode, mostly due to reactions from water.	Water erosion describes any type of erosion done by water, this affects mostly rocks, sand, soil, and shorelines.	Wind erosion occurs when wind changes a landscape by move the particles in the landscape. This can occur mostly in deserts.





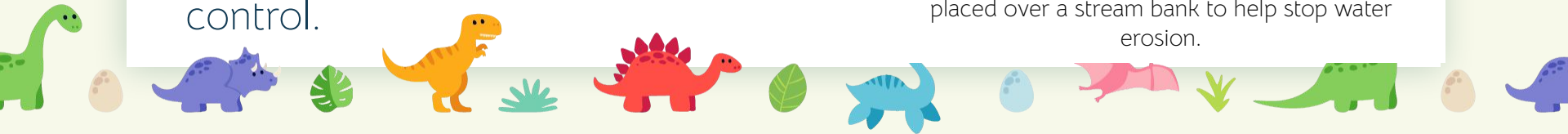
Is Erosion Controllable?

Yes and No.

Many preventatives can be set up to help **slow down the erosion** of riverbanks and farmland, however, this doesn't completely stop it. Best Management Practices (BMPs) help with erosion control and water quality control.



This is an example of erosion control, tarps are placed over a stream bank to help stop water erosion.





Erosion in Real Life

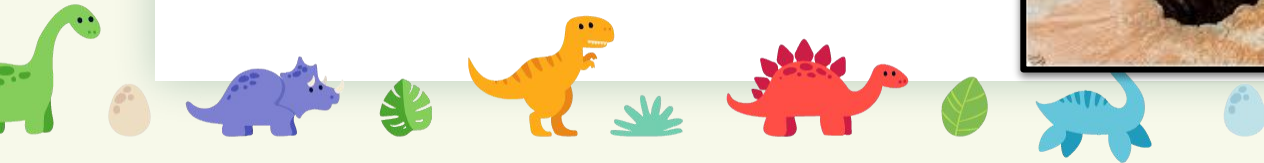
Erosion can cause some beautiful natural landscapes. The grand canyon (top right) is a product of erosion!





Erosion in Real Life

Erosion can also cause severe damage to the natural landscapes and man-made structures as well.





Modeling Erosion

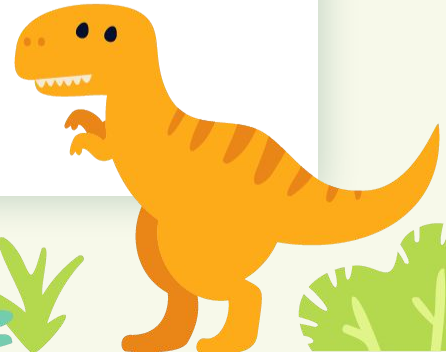
1. Fill your container with sand or soil (use gloves if necessary)
2. Make different "land formations" out of the soil/sand
 - a. Add elevation
 - b. Slopes (one part of the soil is higher than the other)
3. Add ice cubes at the top of your slope.
4. Poke a small hole on the bottom of the paper cup using the scissors
5. Pour the water into the cup and drain the water over your land formation
 - a. Simulate rain!
6. Lightly blow on your structure with a straw
 - a. Simulate wind!
7. Observe the changes to your structure
 - a. What color is the water now?
 - b. What parts are higher?
 - c. Can you see where the water ran through the soil?

Materials:

- Deep pan or container
- Plastic/paper cup
- Scissors
- Water
- Sand or Soil
- Staw (optional)
- Ice cube (optional)
- Gloves (optional)



Fossils

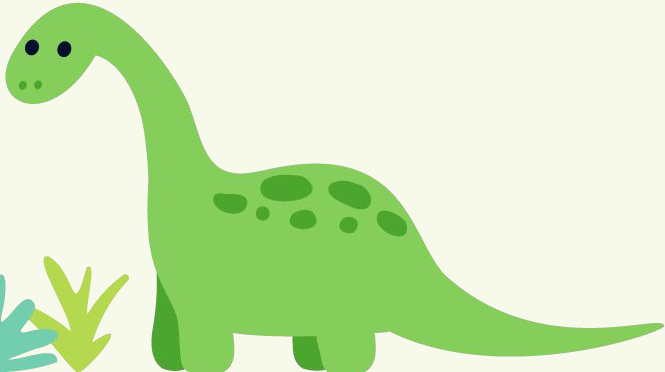
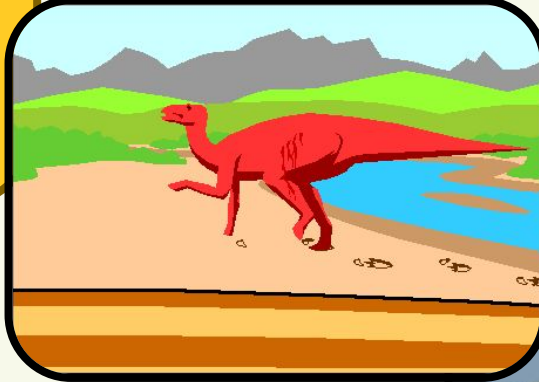


Fossils

Materials:

- Small disposable cup
- Small objects/toy that can fit inside the cup
- Chocolate Chips
- Bowl
- Spoon
- Knife (adult supervision!!)
- Microwave (adult supervision!!)
- Refrigerator

Have you ever wondered how fossils are formed? What are they really? Who cares?



What is a fossil?

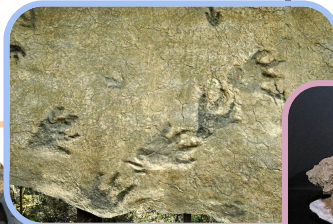
Fossils are the preserved remains of animals, plants, and other organisms from the distant past. **They are ROCKS.** Fossils can preserve an entire organisms or just parts of one.



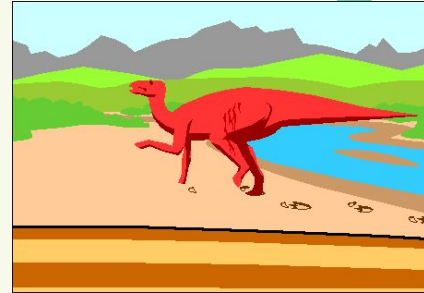
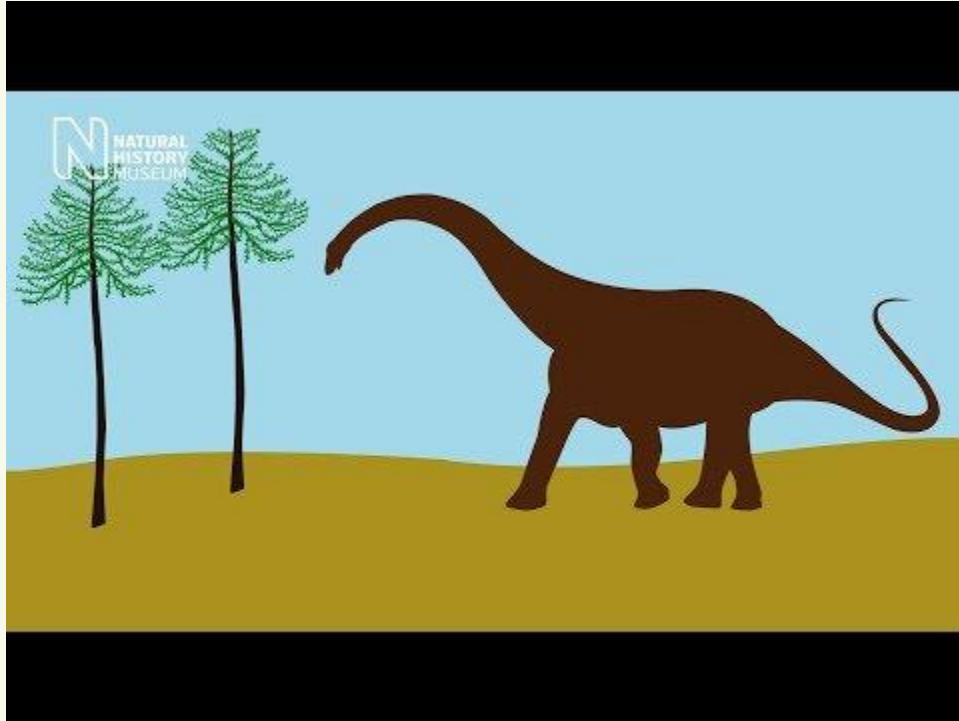


Types of Fossils

Body Fossils	Molds and Casts	Permineralization / Petrification	Footprints and Tracks (Trace)	Coprolites
<p>MOST COMMON. The remains of dead organisms, most are hard parts. Typically soft tissues like skin and muscle disintegrate leaving only the hard shell or bone skeleton behind.</p>	<p>A mold is an imprint left by the shell of a hard skeleton on surrounding rock. A mold may be internal or external.</p> <p>Paleontologist can produce cast from molds with latex and 3D printing.</p>	<p>When groundwater saturates a plant/animal remains after it dies, sometimes the materials dissolve and minerals replace them. The organic matter is 100% replaced with mineral and turns to stone, replicating every detail.</p>	<p>Footprints, tracks, and burrows through mud can sometimes harden and become trace fossils. This can provide information on how organisms behaved and moved.</p>	<p>Fossilized feces gives clues to where certain organisms lived and what they ate.</p> <p>RARE because feces usually decays quickly.</p>



How are fossils formed?



How are fossils formed demo - **Your Turn!**

Materials:

- Small disposable cup
- Small objects/toy that can fit inside the cup
- Chocolate Chips
- Bowl
- Spoon
- Knife (adult supervision!!)
- Microwave (adult supervision!!)
- Refrigerator

Part 1

1. Melt chocolate in bowl
 - a. Heat about 2 cups of chocolate chips for 30 second intervals, stirring between, until smooth and melted
2. Fill disposable cup about half way full with melted chocolate
3. Place small object / toy so it is entirely or nearly covered in chocolate
4. Top off the cup with more chocolate as needed
5. Refrigerate until hardened

Part 2

1. After chocolate has hardened remove from refrigerator, tear away the cup
2. Use a knife to cut the chocolate in half
3. Carefully pull out the object/toy
4. Observe the demo fossil cast. How is it similar / different from a real fossil

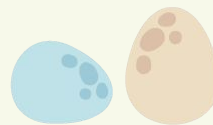
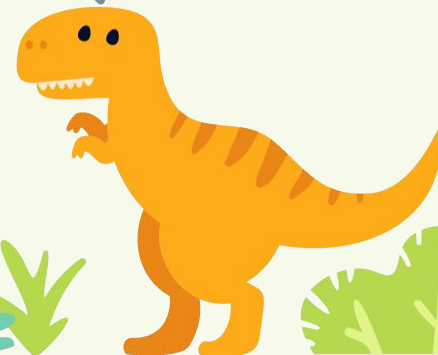
Watch
the
demo
HERE

FOSSIL FONDUE





Travel the world, dig up some fossils, and reconstruct some dinosaurs in this dinosaur dig site simulation game linked [HERE!](#)





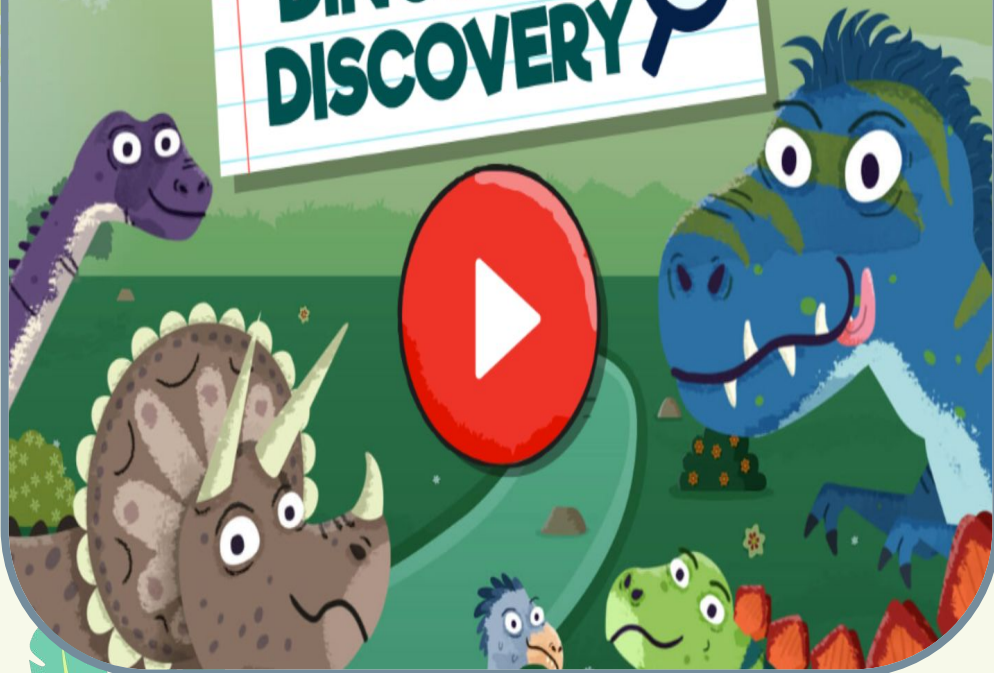
Who Cares?

Scientists use fossils to gather information about the **lives** and **evolutionary relationships** of organisms, for understanding **Earth's geological change** ([click HERE](#) for an interactive globe), **environmental change**, and even for locating **fossil fuel reserves**.

Engineers study fossils to help develop new technologies through **biomimicry** (using processes from nature to improve modern technological processes or objects). They also help **design and develop new tools** to help scientist discover and analyze fossils.



DINOSAUR DISCOVERY



Would a T.rex catch a Triceratops? What did a Stegosaurus eat? Where did the Yi find its food? How do we know what dinosaurs looked like? Make predictions, use scientific equipment and perform experiments to find the answers to lots of questions about dinosaurs.

You'll need to use your science skills to collect all the dinosaur stickers and become a dino-expert!

Click [HERE](#) to access the game!



Rocks



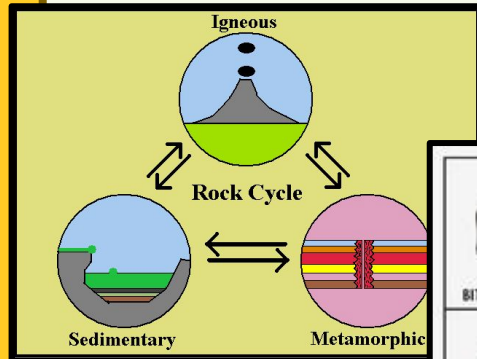
Rocks

Materials:



- Computer
- Access to Gizmo - link provided

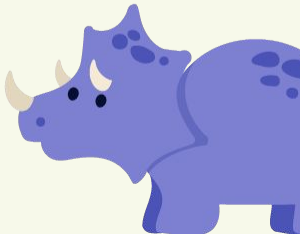
Optional

- Unknown Rock/Mineral
- Penny
- Steel nail
- Bathroom tile
- Glass plate (picture frame works!)
- Yogurt container
- Kitchen scale
- Small bowl
- Water
- Measuring Cup



Did you know there is a rock cycle? How do you know what type of rock you found? What are minerals?

1  BITUMINOUS COAL	2  CHALK LUMPS	3  CHERT	4  CONGLOMERATE	5  DIATOMITE
6  FLINT	7  LIME STONE BLACK	8  LIME STONE SILICIOUS	9  LIME STONE WHITE	10  MUD STONE
11  ROCK PHOSPHATE	12  ROCK SALT	13  SAND STONE RED	14  SAND STONE SILICIOUS	15  SHALE



3 Main Types of Rocks

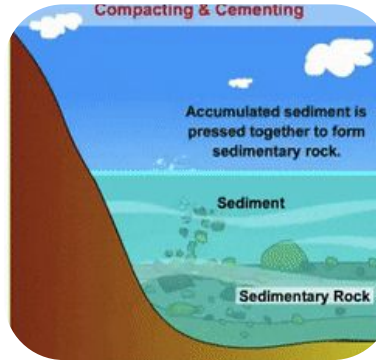
Igneous Rock

Are formed from melted rock deep inside the Earth.



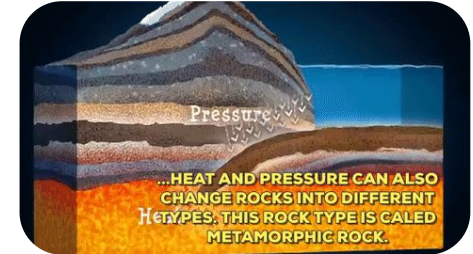
Sedimentary Rock

Are formed from layers of sand, silt, dead plants, and animal skeletons.



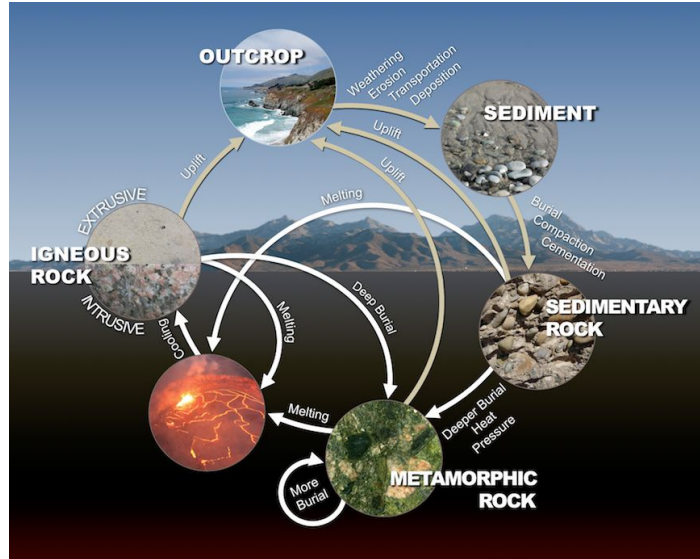
Metamorphic Rock

Are formed from other rocks that are changed by heat and pressure underground.



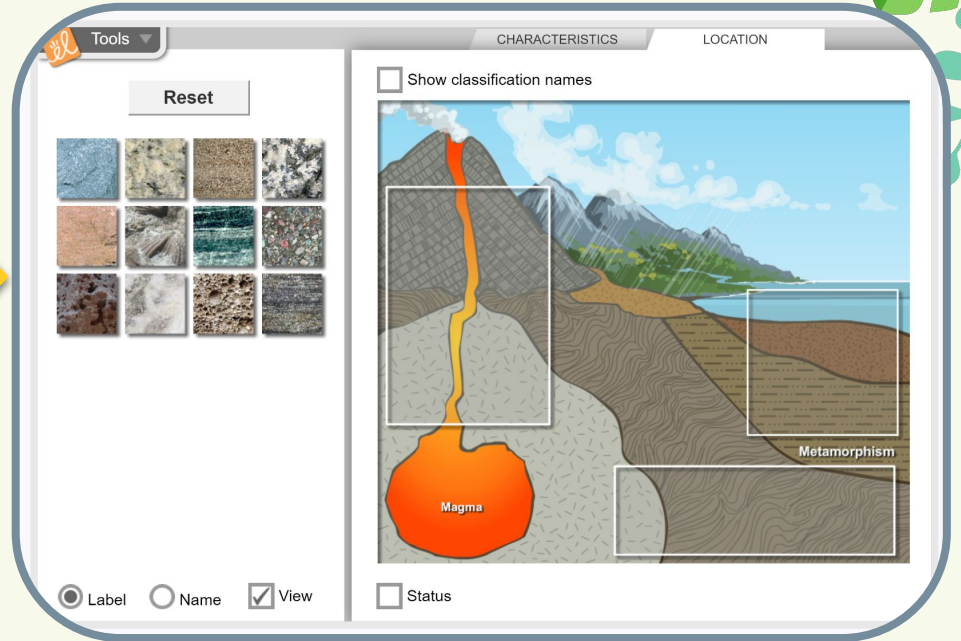


The Rock Cycle



Rock Identification - Test Your Knowledge

Test your knowledge and learn more about rock identification with this [gizmo](#)!



The screenshot shows a digital interface for rock identification. At the top, there are tabs for 'Tools', 'CHARACTERISTICS', and 'LOCATION'. Below the 'Tools' tab is a 'Reset' button and a 3x4 grid of 12 small rock sample images. To the right, under the 'CHARACTERISTICS' tab, there is a checkbox labeled 'Show classification names'. Below this is a large geological cross-section diagram showing a volcano with a magma chamber labeled 'Magma' and a lava flow. The diagram also shows various rock layers and a region labeled 'Metamorphism'. At the bottom of the interface, there are radio buttons for 'Label', 'Name', and 'View' (which is selected), and a checkbox for 'Status'.

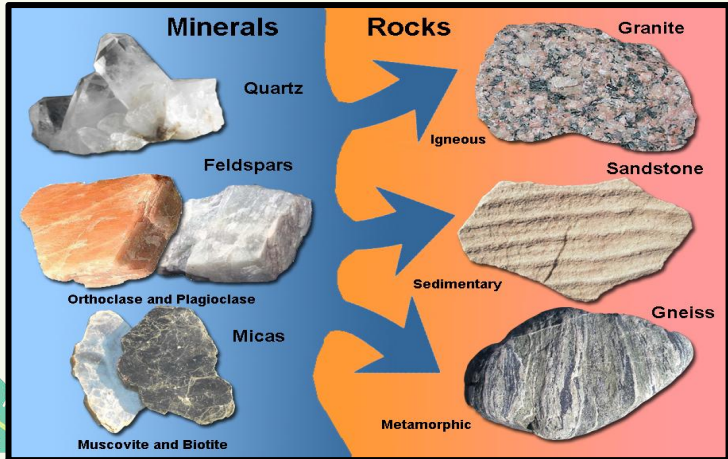


Rocks vs Minerals

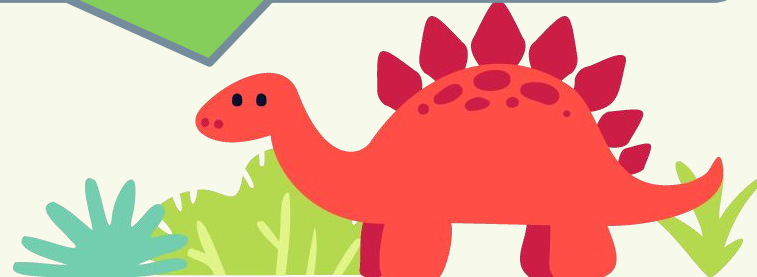
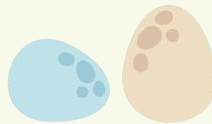


Rocks are made of different kinds of minerals, or broken pieces of crystals, or broken pieces of rocks. Some rocks are made of the shells of once-living animals, or of compressed pieces of plants.

Minerals are naturally occurring inorganic elements or compounds having an orderly internal structure and characteristic chemical composition, crystal form, and physical properties. Minerals generally form crystals and have specific physical and chemical properties which can be used to identify them. Sometimes single minerals form rocks, as in quartz. Quartz is the most common form of crystalline silica and is the second most common mineral on the earth's surface.



A good way to think about it is if a **chocolate chip cookie was a rock**, then the **flour, sugar, butter, chocolate chips are the minerals** that make up that rock!





Identify Your Own Rocks and Minerals

Materials:

- Unknown Rock/Mineral
- Penny
- Steel nail
- Bathroom tile
- Glass plate (picture frame works!)
- Yogurt container
- Kitchen scale
- Small bowl
- Water
- Measuring Cup

Follow the instructions [HERE](#) on how to identify your own rocks and minerals!





**Learn
More
Here**



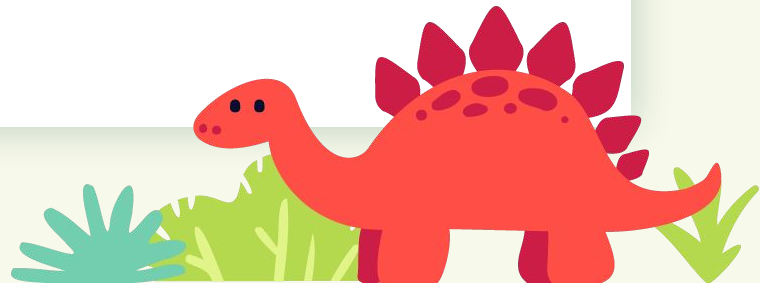
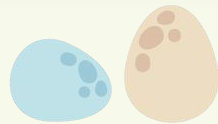
Rock Identification - Who Cares?!

Geologists study rocks because they contain clues about what the Earth was like in the past. We can assemble a historical record of a planet and trace events that occurred long before humans. First, by studying how the Earth and other planets worked in the past, **we can better understand how they are working today.** This helps us understand **our effects on the environment and its potential effects on us.** Basically... **to better understand our world.** This helps us to better coexist with nature and reap the benefits that it has to offer.



**Learn
More
Here**

Geysers



Homemade Geyser

Materials:

- Water
- Liquid Soap
- Small bottle with a narrow neck
- Large tub/sink
- Alka-Seltzer tablets
- Sponge/wipes for clean up



Have you ever wondered how a geyser works? Or for that matter what in the world IS a geyser?





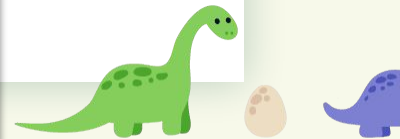
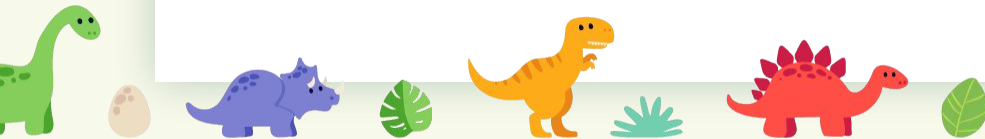
What is a Geyser?

Geyser's are an extremely rare occurrence on Earth, there are only about 1000 geysers on Earth.

Think of a geyser as like a vent in Earth's surface. Periodically, the vent will overflow and become pressurized and blast boiling hot water into the air.



Old Faithful in Yellowstone National park is one of the most famous geysers.





How do Geysers Occur?

Geysers occur when there is copious amounts of pressure underneath the earth's surface. This pressure forces boiling water upwards and through the surface through a hole in the ground. When there is a combination of a water supply, an underground plumbing system, and some sort of heat source.



Medium Video



Mild Video





Demo Time!

Follow the instructions below or linked [HERE](#) for more details

1. Place the small bottle into a sink / basin
2. Fill the bottle *almost* to the top with warm water and add a few drops of soap.
3. Drop a broken up Alka-Seltzer packet and immediately cover the top with your hand.
4. Listen to the sound that the solution makes, what pressure do you feel?
5. Release your hand



Another classic demonstration...



drop some mentos (2-3) into a bottle of diet soda... you may want to **do this outside!**

Materials:

- Water
- Liquid Soap
- Small bottle with a narrow neck
- Large tub/sink
- Alka-Seltzer tablets
- Sponge/wipes for clean up



Think about it...

1. How did the pressure created in the experiment model a real life geyser?
2. How would you improve this experiment/demo?
3. What did you learn today?

