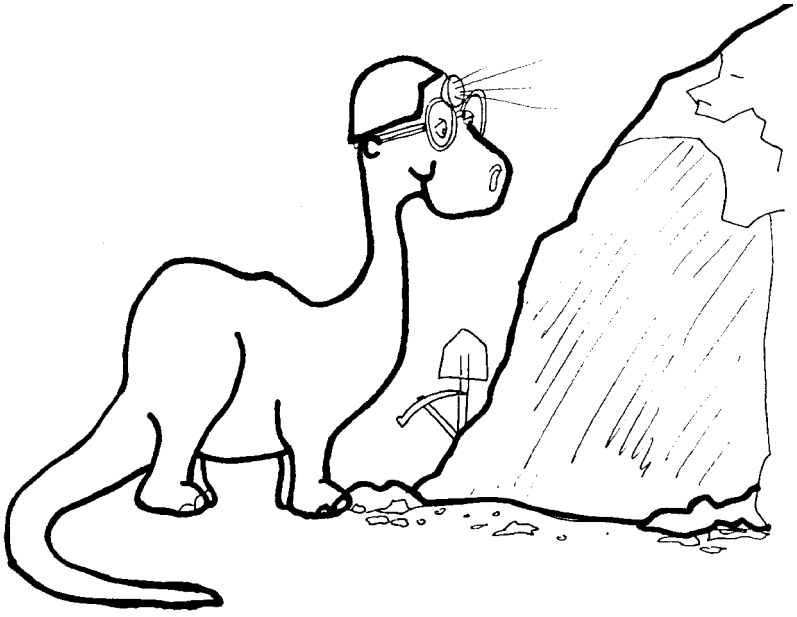
# Rock Cycle

## Understanding the Earth's Crust

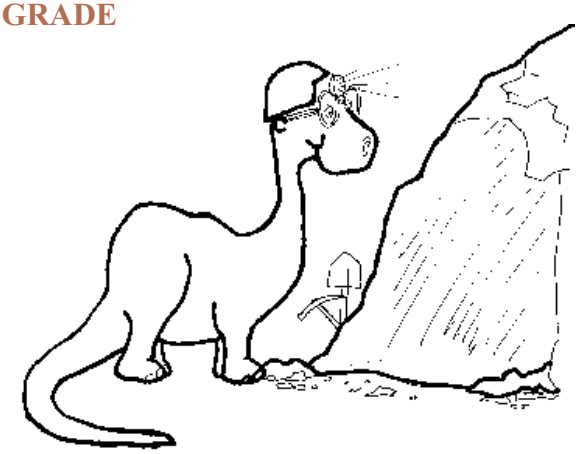
# FIFTH GRADE

# PAST LIFE



1 WEEK
LESSON PLANS AND
ACTIVITIES

## ROCK CYCLE
## OVERVIEW OF FIFTH GRADE



### CHEMISTRY

**WEEK 1.**
PRE: *Describing a chemical reaction.*
LAB: *Illustrating how molecules move.*
POST: *Comparing salt and sugar crystals.*

### MINERALS

**WEEK 2.**
PRE: *Exploring minerals made of elements and compounds.*
LAB: *Discovering the different hardness of minerals.*
POST: *Analyzing why one mineral is harder than another.*

**WEEK 3.**
PRE: *Exploring how minerals are useful.*
LAB: *Analyzing minerals for their usefulness.*
POST: *Distinguishing colors derived from minerals.*

### ROCKS

**WEEK 4.**
PRE: *Interpreting the different environments where rocks form.*
LAB: *Analyzing the origin of different sands.*
POST: *Comparing areas where sedimentary particles are deposited.*

**WEEK 5.**
PRE: *Exploring the creation of caves.*
LAB: *Examining different sedimentary rocks.*
POST: *Exploring the difficulties in identifying rocks.*

### PAST LIFE

**WEEK 6.**
PRE: *Exploring paleontology.*
LAB: *Illustrating how fossils are preserved.*
POST: *Comparing the different eras of time.*

**ROCK CYCLE PAST LIFE (5)**

**PRE LAB**

Students determine the organism by looking at bones of the feet.

**OBJECTIVE:**

1. Analyzing how animal bones can help us identify specific animals.
2. Exploring paleontology.

**VOCABULARY:**

bones
fossil
paleontology

**MATERIALS:**

worksheet

Insect in amber

**BACKGROUND:**

Paleontology is the study of old (paleo-) life (-onto-). It is a relatively new science in Western culture. The history of paleontology is a very interesting case of the development of human thought. The influence of religion prevented even the thought of extinct organisms for a long time. Fossils were perceived as "oddities" of nature. Therefore, the early scientific literature, from the Greeks until 1600's, was full of explanations that included many myths and stories about objects that we now know are fossils. Shiny, button-shaped fossil fish teeth were thought to come from the heads of toads. Clam fossils were hoofs of sheep. Ammonites, a sea animal similar to the modern Nautilus, were interpreted as coiled snakes turned to stone by a saint. The fossil tusk of the narwhal, a small whale, was for many years thought to be from the magical unicorn. Fossil oysters were nicknamed the Devil's Toenails. The connection between fossils and now extinct species was also an important breakthrough for a fuller understanding of geologic time.

In many animals, the shape and relative position of bones determine the general form of the animal. Land vertebrates evolved from freshwater or marine vertebrates. This change entailed many modifications in the organisms' limb bones, as their shape and function changed from fins used for balancing or motion in water to legs used for weight-bearing and walking on land. Limbs with digits replaced the paired fins, and the overall size and density of the bones increased.

**PROCEDURE:**

1. On their lab sheets, have the students attempt to pair the name of the organism with the bones of its fore limb. Here are answers to guide you:

A. The rhinoceros (#1) is heavy boned to support its weight.

B. The monkey (#2) has an opposable thumb, capable of gripping objects as do humans. Have students look at their hands to see their opposable thumb.

C. The lizard's limb (#3) is long and can hold onto surfaces. The turtle's foot (#4) is almost a web-like structure.

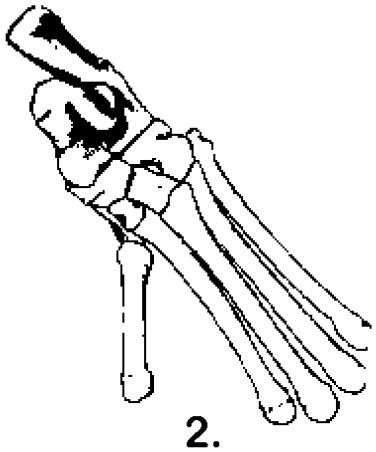
D. The pelican limb (#5) is long and narrow, and shows a bird's characteristic hollow, light weight structure.

**ROCK CYCLE - PAST LIFE (5) PRE LAB**

Whose bones do the pictures belong to?

Choose your answer from: turtle, pelican, rhinoceros, lizard, or monkey

1.



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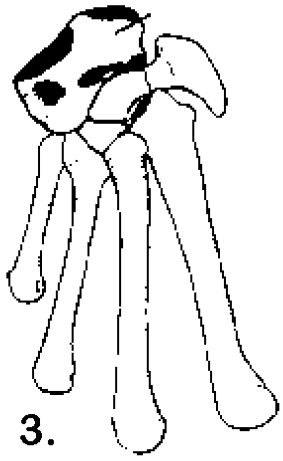

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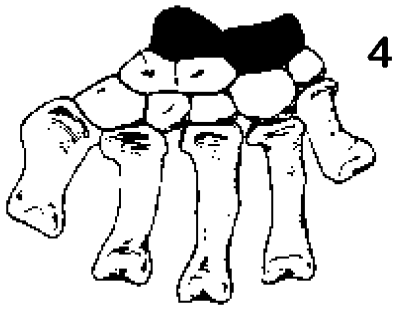
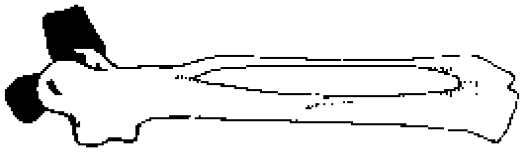


4.

5.



**ROCK CYCLE PAST LIFE (5)**

**LAB**

Students make a mold and cast.

**OBJECTIVE:**

1. Illustrating how fossils are preserved.
2. Making fossils.

**VOCABULARY:**

cast
fossil
impression
mold

Fossils often look “worn” or damaged, due to the effects of fossilization.

**MATERIALS:**

plaster of Paris
Rock Cycle - Past Life (5)
clay
petroleum jelly

**BACKGROUND:**

The chance that an organism will be preserved as a fossil is low. Geological processes such as erosion, weathering, sedimentation, and leaching constantly "attack" the fossil, which may destroy it before anyone sees it.

There are two main types of fossil preservation. Most common is fossil preservation with alteration; the original organic material is partially to fully changed into new material. There are several types of preservation with alteration:

A) carbonization, a chemical reaction where water transforms the organic material of plant or animal to a thin film of carbon. Nitrogen, hydrogen, and oxygen are driven off as gases, leaving an outline of the organism. Organisms often preserved by carbonization include fish, leaves and the woody tissues of plants.

B) permineralization or petrifaction takes place in porous materials such as bones, plants and shells. The material is buried; later, groundwater percolates through its pore spaces. A solution, commonly supersaturated in either calcium carbonate or silica, precipitates minerals in the spaces. The original wood or shell like material preserved.

C) recrystallization changes the internal physical structure of a fossil. Recrystallization changes the microstructure of the original minerals; they often reform as larger crystals. The composition of the mineral does not change, only the crystal structure.

For example, many shells originally composed of calcium carbonate in the form of the mineral aragonite recrystallize into the more stable form of calcium carbonate called calcite.

D) replacement involves the complete removal of original hard parts by solution and deposition of a new mineral in its place. The Petrified Forest in Arizona is an excellent example of this type of preservation. Here the original organic material (wood) has been wholly replaced by silica.

The second type of fossil creation is direct preservation, the preservation of fossils without alteration. The most common directly preserved fossils are unaltered hard parts of a living organism, like shells, teeth, and bones. This material is unchanged, except for the removal of less stable organic matter. Other examples of this type of preservation include fossil corals, shells, sponges, microscopic fossils and a host of other organisms with hard parts. In rare circumstances, preservation of the soft parts of an organism may occur.

Paleontologists can also study past life using indirect evidence about how the organisms lived. Types of indirect evidence include molds and casts, tracks and trails, burrows and borings, and coprolites.

The formation of a mold and cast is a very common type of indirect preservation. After the remains of an organism have been buried and cemented withing sediment, water percolating through the sediment leaches out the fossil. This leaves a cavity in the rock, called a mold. A cast then forms when the mold is filled up with another substance. In some cases minerals such as calcite or quartz precipitate in the mold; elsewhere loose sediment may fill it up. The formation of a cast is similar to putting jello in a mold; when you remove the mold, you are seeing the cast of the mold.

The other types of indirect evidence are collectively called trace fossils. A trace fossil gives a paleontologist some evidence of the organism's behavior. There are three main types of trace fossils. Tracks and trails are produced by an organism walking, crawling, foraging, or resting. For example, dinosaur tracks provide information about how large the dinosaur was, how fast it walked, and whether it walked alone or in a group. Burrows and borings are the tunnels or burrows left by organism digging into the ground, either on land or underwater. This may indicate whether the animal was feeding, dwelling, or just foraging. Finally, coprolites are fossilized animal excrements. They give some indication of the structure of the animal's gut, and sometimes provide clues to its diet.

**PROCEDURE:**

1. In this lab the students prove that the "present is the key to the past" by using the remains of present day living organisms to make their own fossils. They will simulate the formation of mold and cast fossils.

This lab can be extended by having each student group construct a "mini" analysis of their fossils. Have the students point out features such as the quality of fossil preservation, features that may have fossilized well or not at all, or any other observations

or conclusions that you assign or that they discover.

A short version of this lab is to prepare the molds and casts in advance, and have the students try and determine which impression belongs to which shell.

Before lab, prepare the materials for each student group. If you have not made mold and cast “fossils” before, you may wish to practice before working with the class.

2. Explain the principles of fossilization to the students. Be sure to describe the formation of mold and cast fossils. Tell the students they will make examples of molds and casts in the lab. Emphasize to the students that not all the information about an organism can be recorded in a fossil. Not all objects fossilize well. For example, objects with soft parts (like leaves) do not make good molds. Also, objects like gastropods (which are detailed inside the shell) only represent the outside, which can be misleading to whomever finds the fossil. Paleontologists sometimes have to act like detectives to trace what the organisms originally looked like. Sometimes they never find out!

3. Each student group should make a mold and cast of a different type of fossil. If you have enough plaster of Paris, have the students make individual fossils. Use the instructions below to guide students in making fossil impressions.

a. Flatten a piece of plasticine or modeling clay. This will be the base for making the mold and cast, so make sure the flattened clay is wider than the object to be “fossilized.” To help guide your students (this is optional, but recommended), make a ring from a strip of thick paper. The diameter of the ring should be greater than the width of the object. Tape the ends of the strip together.

b. Push the ring into the clay. Cover the object with a little petroleum jelly. Press it into the clay, just enough so that it is firmly in place.

c. Pour a thin layer of plaster of Paris into the ring, just enough to cover the object. Let it dry for a few hours. Drying time will depend on how wet you made the mixture and the thickness of the layer.

d. Remove the ring and carefully separate the clay from the plaster of Paris mold. Gently remove the object. Now you have a model "mold" of the object.

4. If desired, have the students paint their fossil with water-based paint. Have them try to make it look realistic.

**ROCK CYCLE - PAST LIFE (5)**

**PROBLEM:** How can fossils be preserved?

**PREDICTION:**_____

**PROCEDURE:**

**MATERIALS:** two types of coral, scallop, snail, or other objects, plaster of Paris, clay, petroleum jelly, margarine dish, spoon

**EXERCISE I**. Each group at a table will "fossilize" one organism. Your instructor will illustrate how to make the impression with plaster of Paris. However, BEFORE you make the impression, record what you think will be made by the impression.

| ORGANISM | DRAW THAT YOU THINK THE IMPRESSION WILL LOOK LIKE | DRAW THE ACTUAL IMPRESSION |
|---|---|---|
| | | |

**EXERCISE 2**. Look at the fossils that were made by 5 different classmates. Can you determine what each object was before it became a fossil? Record what you think the fossil is, and then when your classmate states what it is, check your answer.

| NAME OF CLASSMATE | WHAT ORGANISM IS IT AND WHY |
|---|---|
| | |
| | |
| | |
| | |
| | |

**CONCLUSION**: Which "fossil" was preserved the best? Why?

_____

The worst? Why?

_____

**ROCK CYCLE PAST LIFE (5)**

**POST LAB**

Students use the internet to discover geologic time.

**OBJECTIVE:**

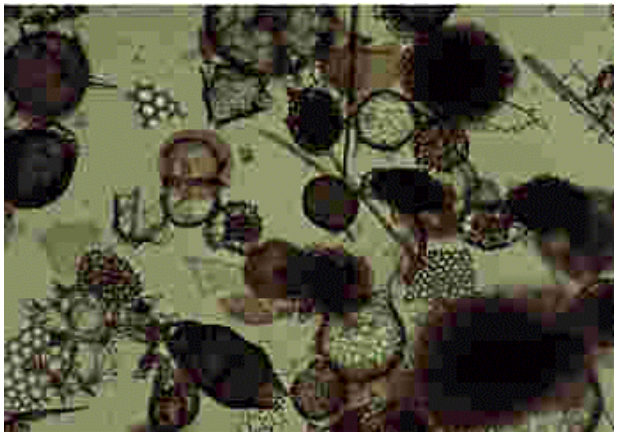
1. Exploring geologic time.
2. Comparing the different eras of time.

**VOCABULARY:**

Cenozoic
Mesozoic
Paleozoic
Precambrian

**MATERIALS:**

Internet
time chart



Radiolarian have changed shape through time.

**BACKGROUND:**

Geologic time is often very difficult to understand. Most children have trouble understanding the impact of 10 years, not to mention the 4.5 billion years that have passed since the formation of the Earth. It is difficult to date exactly how old the Earth is because no one was there to record the event. There are many lines of evidence for the age of the Earth, within your students' lifetimes this number will probably change as new technology helps us to better date the past.

Students are familiar with dinosaurs and possibly a few other fossils seen in class, but the idea that certain organisms lived at certain times is very difficult for them to comprehend. The oldest unmistakable fossils are about 3.8 billion years old. However, multicellular organisms, the type that we are familiar with did not appear in the fossil record until approximately 650 million years ago. Animals with hard body parts (skeletons) did not appear until about 580 million years ago.

In order to work with the vast time of earth history, geologists have developed the geologic time scale. This scale subdivides geologic time is divided into two eons, the PrePhanerozoic (or Precambrian) and Phanerozoic. The PrePhanerozoic Eon stretches from the formation of the earth, more than 4.5 billion years ago, until the start of the Phanerozoic. There are many fossils in PrePhanerozoic rocks, but they are microscopic. Phanerozoic means “visible life” which covers about the last 545 million years of earth history, are characterized by abundant visible fossils.

The Phanerozoic Eon is divided into three eras: the Paleozoic, Mesozoic, and

Cenozoic. In the Paleozoic or "old life," the first bony fish, amphibians, and reptiles appear. Mammal-like reptiles (our probable ancestors) first evolved toward the end of this era. Ferns and gymnosperms (conifers) were the dominant types of plants. Dinosaurs become abundant in the Mesozoic, which means “middle life.” True mammals and birds also appeared during this time period, as do the first angiosperms (flowering plants) In the Cenozoic Era, mammals became dominant, and grasses evolved. The earliest human ancestors first occurred about 3-5 million years ago.

**PROCEDURE:**

1. Use the Earth-Life-Plate Configuration chart to discuss the different periods of time. Make sure you make the connection that the distribution of land and water has changed through time. Habitats have changed due to plate tectonics.

2. Instruct the students to find about five different organisms that lived during the different periods by searching the web.

There are many web sites on fossils. Here are three good starting points:

http://www.ucmp.berkeley.edu/help/timeform.html - the University of California, Berkeley’s Paleontology Museum. This link starts at the geologic time scale. It links from there to specific time periods and organisms.

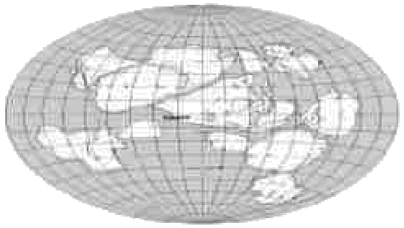
http://www.fmnh.org/exhibits/exhibit_sites/lot/LOT1.htm - the Field Museum of Natural History. A link to an on-line version of their Phanerozoic Life exhibit.

http://members.aol.com/fostrak/kpaleo.htm - a link to a good paleontology link site.

3. You can also have your students do a web search on any of the search engines. You may want to use the different time periods as a way for students to search for information.

## ROCK CYCLE PAST LIFE (5) - POST LAB

### EARTH-LIFE-PLATE CONFIGURATION CHART

| EON | ERA | PERIOD | EPOCH | Mya | Events in the History of Life | Plate Tectonic Events |
|---|---|---|---|---|---|---|
| PHANEROZOIC | Cenozoic | Quaternary | Holocene | 0.01 | Extinction of many prehistoric animals |  Today - the modern plates and continents |
| | | | Pleistocene | 1.8 | Beginning of the modern "Ice Age" | |
| | | Tertiary | Pliocene | 5 | First human ancestors | |
| | | | Miocene | 23 | Widespread formation of grasslands | |
| | | | Oligocene | 38 | Evolution of prehistoric animals |  50 million years ago: Pangaea has split up into today's continents |
| | | | Eocene | 54 | Earliest grasses | |
| | | | Paleocene | 65 | Earliest rodents and horses | |
| | Mesozoic | Cretaceous | | 146 | Extinction of dinosaurs and many other creatures<br>Earliest placental mammals<br>First flowering plants<br>Fish become dominant marine vertebrates | |
| | | Jurassic | | 208 | Pine trees and related plants are common |  260 million years ago: Pangaea, the next supercontinent, has formed |
| | | Triassic | | 245 | Earliest mammals and birds<br>Earliest dinosaurs and turtles<br>Mass extinction - 98% of species vanish | |
| | Paleozoic | Permian | | 286 | | |
| | | Carboniferous | Pennsylvanian | 325 | Ferns and spore-bearing plantsabundant | |
| | | | Mississippian | 360 | Earliest reptiles | |
| | | Devonian | | 410 | First amphibians<br>Evolution of bony fish and shark ancestors |  480 million years ago: Rodinia has broken up |
| | | Silurian | | 440 | Earliest land plants | |
| | | Ordovician | | 505 | Earliest fish and vertebrates | |
| | | Cambrian | | 545 | Earliest molluscs and related groups<br>First animals with shells | |
| PREPHANEROZOIC | | Proterozoic | | 700<br>1400<br>2500 | First soft-bodied animals<br>First trace fossils<br>First multicellular animals |  750 million years ago: Rodinia - the first supercontinent |
| | | Archean | | 3500<br>3800<br>4000 | Earliest photosynthetic bacteria<br>Earliest bacteria fossils<br>Oldest rocks | |
| | | | | 4600 | Formation of Earth | |