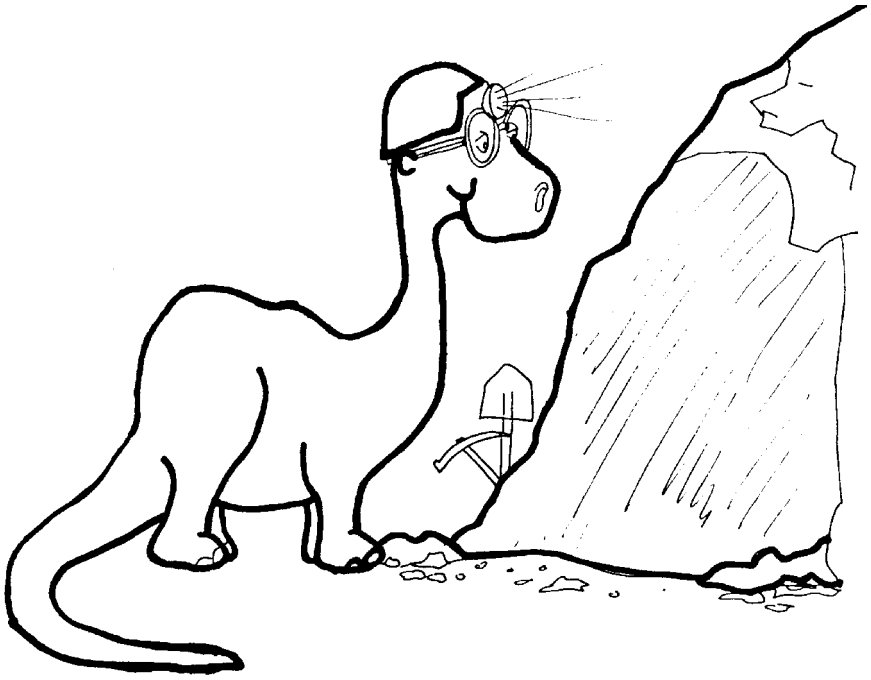
Rock Cycle

Understanding the Earth's Crust

SECOND GRADE

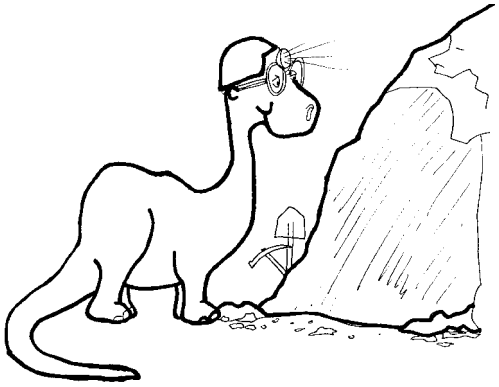
PAST LIFE



2 WEEKS
LESSON PLANS AND
ACTIVITIES

ROCK CYCLE
OVERVIEW OF SECOND GRADE

CHEMISTRY



WEEK 1.
PRE: *Comparing the states of matter.*
LAB: *Observing the elements on the periodic table.*
POST: *Exploring the states of matter of the elements.*

MINERALS

WEEK 2.
PRE: *Observing "things" logically.*
LAB: *Comparing different minerals.*
POST: *Discovering rocks and minerals near school.*

WEEK 3.
PRE: *Observing the structure of crystals.*
LAB: *Exploring how minerals can grow.*
POST: *Designing a "mineral person."*

ROCKS

WEEK 4.
PRE: *Recognizing the three types of rocks.*
LAB: *Observing the three types of rocks.*
POST: *Writing a paragraph on rocks.*

PAST LIFE

WEEK 5.
PRE: *Comparing present day and fossil organisms.*
LAB: *Exploring how dinosaur footprints are formed.*
POST: *Dramatizing how different dinosaurs lived.*

WEEK 6.
PRE: *Exploring the environment of the Mesozoic.*
LAB *Learning how fossils are made.*
POST: *Comparing how fossils appear in the literature.*

ROCK CYCLE - PAST LIFE (2A)

PRE LAB

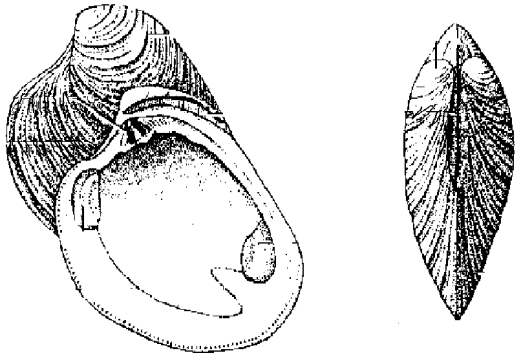
Students compare living and fossil shells.

OBJECTIVES:

1. Exploring how fossils are made.
2. Comparing present day and fossil organisms.

VOCABULARY:

extinct
fossil
preserved



MATERIALS:

fossil shell and a present day shell
extinct animals

BACKGROUND:

Fossils are the remains of plants and animals that lived long ago. Most fossils were formed when the hard parts of an animal were buried in soft mud, silt, or sand. Over thousands of years the original bone, wood, or shell decayed or dissolved away, but its shape was preserved by minerals that seeped in and replaced the original material. Sometimes a fossil organism can be preserved exactly as it was when it died. This is very uncommon.

There are two main types of fossil preservation. Most common is fossil preservation with alteration. This is when the original organic material is partially to fully changed into new material. Types of preservation with alteration include carbonization, permineralization, recrystallization, and replacement.

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 bone. This material is unchanged, except for the removal of less stable organic matter. 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. An example is Dimo, a baby mammoth found in the tundra of Siberia. The ice "froze" all the body parts. The preservation was so good that paleontologists were able to determine that the baby mammoth died of blood poisoning. Another example is an insect which has become "stuck" in tree resin. When the resin fossilizes to form amber it preserves the insect. This was the whole premise for the movie Jurassic Park.

PROCEDURE:

1. Show the students a fossil and its present day equivalent. Have them compare degree of preservation, color, texture, and any other characteristics that they see.

2. Emphasize that fossils do not represent the entire animal, so paleontologists (scientists who study fossils) must to be very careful when making conclusions about the original living organism.

3. Discuss with your students that there are many types of fossils, representing many kinds of organisms. Not all fossils that we find represent extinct organisms. Dinosaurs are extinct, but sharks and clams are not. The living representatives of sharks and clams still look similar to the fossils that their ancestors left behind. Lead the students into a discussion concerning the following fossils, and talk about whether the specimens represent extinct animals (referring to the organism as a group, not as an individual species) and what part of each organism might or might not be preserved in the form of a fossil. Use the following diagram to guide you.

FOSSIL	EXTINCT?	PRESERVED?
dinosaur	yes	bones, teeth
sharks	no	teeth
clams	no	outer shell

ROCK CYCLE - PAST LIFE (2A)

LAB

Students make and record prints from models.

OBJECTIVES:

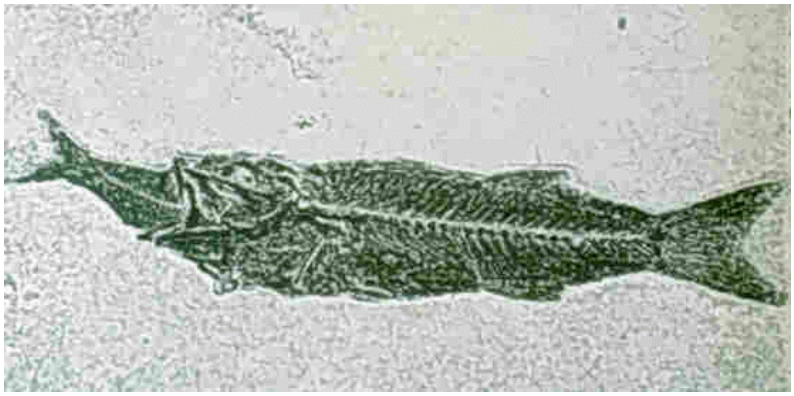
1. Exploring how dinosaur footprints are formed.
2. Learning about trace fossils.

VOCABULARY:

trace fossil
imprint

MATERIALS:

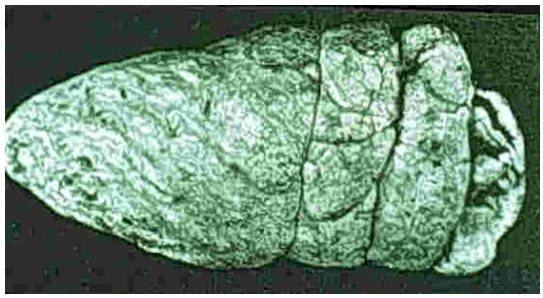
Playdough or soft clay
dinosaur models
rulers



A fossilized fish, preserved in shale

BACKGROUND:

Some organisms leave information about their activities in rocks. Paleontologists use these clues to recreate how the organisms may have lived. These clues are called trace fossils. There are several main types of trace fossils. Tracks and trails are produced by an organism walking, crawling, foraging, or resting. Many dinosaur tracks tell us something about how large the dinosaur was, how fast it walked, and who walked with it.



A dinosaur coprolite

Burrows and borings are the tiny tunnels worms and other creatures make as they move through the ground. Different types of burrows indicate feeding, dwelling, or foraging behaviors. Coprolites are fossilized animal excrements. They help in determining the approximate structure of the animals gut and may give some indication of the animals' diet.

PROCEDURE:

1. This activity has the students create their own "trace fossil," by making a hand print. This hand print can provide information, just like a dinosaur footprint provides information about the lifestyle of dinosaurs. Tell the students that they are going to make an imprint much like the way dinosaurs made footprints.

2. Have the students roll the Playdough or clay into balls and flatten it. Students should press their hands into the dough to make an imprint. Let them compare their hand prints with their neighbors. Have them look at the size, lines of the palm and other characteristics.

3. Emphasize to students that they need to observe the differences very carefully. Measuring and recording these differences is very important. You may wish to ask them how their prints are similar to the dinosaur footprints and how they are different.

4. Give students the dinosaur models and have them make imprints of the foot and skin of the dinosaurs. Make sure that footprints and skin prints of each model are created. Have the students then compare the prints made by the different models. Have them draw their findings on the lab sheet. Students may notice differences between the models and the animals in real life. Remind them that manufacturers of toys sometimes do not create realistic models. Explain that this is a way of getting information about a dinosaur without having a fossilized skeleton. Many times paleontologists rely on only "trace fossils."

PLAYDOUGH RECIPE #1 (dough formed is not as durable as recipe #2)

1 cup flour
1\2 cup salt
2 teaspoon cream of tartar
1 cup water

RECIPE #2. CLASSROOM QUANTITIES (alum helps preserve the playdough)

5 cups of flour
1 cup of salt
2 tablespoons of alum
2 tablespoons oil
3 cups of very hot water

Both recipes need to be cooked over medium heat and stirred for 3-4 minutes until the dough forms a ball and separates from the sides of the pan. You may add food coloring or glitter for special effects. For even distribution, add the food coloring at the same time as the water.

ROCK CYCLE - PAST LIFE (2A) LAB

PROBLEM: How can you obtain information from fossils other than bones?

PREDICTION: _____

PROCEDURE:
MATERIALS: playdough, dinosaur models, rulers
EXERCISE 1: Roll out the playdough and make an imprint of your hand with your fingers all held together. Answer the following questions.

A: How wide is your hand (from the tip of your thumb to the base of your pinky)?
_____

B: How long is your hand (from the tip of your middle finger to the base of your palm)?
_____

C: Do you see any lines running through the middle of the print of your palm?
_____

EXERCISE 2. Roll the playdough until you have a blank surface. Make imprints of each model's feet and skin. Draw what you see.

	FOOTPRINT	**SKINPRINT**
Dinosaur 1		
Dinosaur 2		
Dinosaur 3		
Dinosaur 4		

CONCLUSION: What kind of information can you get from a trace fossil?
_____
_____

ROCK CYCLE - PAST LIFE (2A)

POST LAB

Students examine where dinosaurs lived using the dinosaur globe.

OBJECTIVES:

1. Exploring where dinosaur fossils are found.
2. Discovering that dinosaurs lived all over the globe.

VOCABULARY:

dinosaur
plate tectonics

MATERIALS:

dinosaur globe
world placemat

BACKGROUND:

Dinosaurs roamed the Earth from 230 to 65 million years ago, during the Mesozoic Era. The Mesozoic is divided into three geological periods: the Triassic Period, the Jurassic Period, and the Cretaceous Period. Different dinosaurs lived in each period.

All dinosaurs likely had restricted geographic ranges; no dinosaur lived all over the earth, as people do today. The dinosaurs lived in many areas, and some of the dinosaurs never saw each other. You might want to use the dinosaur inflatable globe that shows where these dinosaurs once roamed. One fact to keep in mind is that when the dinosaurs were alive, the configuration of the continents was different. Plate Tectonics in motion! North America and Eurasia were connected, as were South America and Africa. The continents have slowly moved to their present positions.

PROCEDURE:

1. Bring out the Dinosaur Globe. Have the class stand in a circle. Ask students to tell you what a continent is (a large area of land and rock that is not covered by water). Ask them if they know how many continents there are on Earth today (7) and have them identify Africa, North America, South America, Australia, Antarctica, Europe, and Asia. Explain that the continents have been present on Earth for hundreds of millions of years, although their locations and combinations have changed.

2. Throw the Dinosaur Globe around the circle. Each time it is caught, have the child who catches it read aloud the name, location and time period of the dinosaur closest to their index finger.

3. Using large Carnegie dinosaur models, remind the class that: 1) during the Mesozoic the continents were arranged differently than they are today, and 2) that different types of dinosaurs lived in different parts of the world during each Mesozoic time period. Have students locate where each dinosaur model can be found. Use the key below to locate each dinosaur.

Dinosaur	**Location**
Apatosaurus	western North America
Velociraptor	Central Asia
Stegosaurus	western North America
Tyrannosaurus	western North America
Brachiosaurus	N. America/ East Africa
Parasaurolophus	western North America
Triceratops	western North America
Euoplocephalus	western North America
Pachycephalosaurus	western North America
Maiasaura	western North America

ROCK CYCLE - PAST LIFE (2B)

PRE LAB

Students reconstruct the Mesozoic by making a diorama.

OBJECTIVES:

1. Learning about the environments of the Mesozoic.
2. Comparing geologic time intervals.

VOCABULARY:

Cenozoic
geologic time
Mesozoic
Paleozoic

MATERIALS:

worksheets
crayons
scissors

Nest of baby dinosaurs (dramatization)

BACKGROUND:

Geologic time is divided into two eons; the Phanerozoic and PrePhanerozoic (or Precambrian). Phanerozoic means “visible life”, which covers about the last 545 million years of earth history, are characterized by abundant visible fossils. 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. The Phanerozoic Eon is divided into three eras: the Paleozoic, Mesozoic, and Cenozoic.

The dinosaurs lived in the Mesozoic Era, which lasted about 180 million years, from about 230 million years ago until 65 million years ago. It is subdivided into three different periods: the Triassic Period, the Jurassic Period, and the Cretaceous Period. They appeared during the latter part of the Triassic Period (about 230 million years ago) and disappeared at the very end of the Cretaceous Period. During the 165 million years that dinosaurs existed, many changes took place on Earth. The continents shifted positions, the climate altered, and new types of plants and animals appeared.

Dinosaurs also changed both their appearances and geographic distributions along with Earth's Mesozoic environments. During the Triassic Period most of the continents were together, forming a single supercontinent called Pangaea. The climate was generally warmer than today's. At this time, there were few types of dinosaurs. Each type had a relatively large geographic distribution. As the Mesozoic progressed, Pangaea broke apart and the continents drifted away from each other. Dinosaurs thus could no longer travel

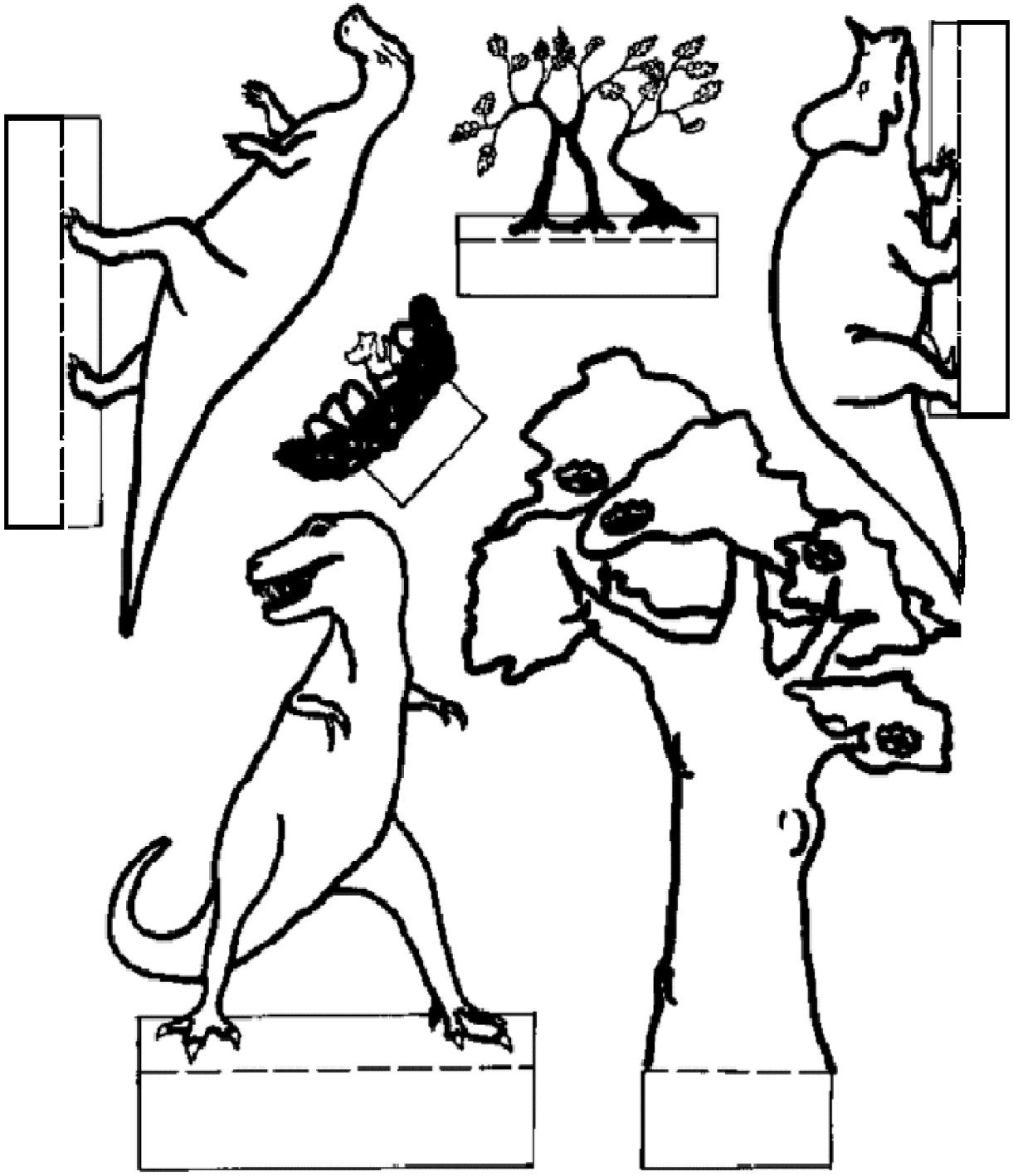
between continents. Species on each continent lived and evolved in isolation from species on other continents. By the end of the Mesozoic, dinosaur diversity (the number of different types of dinosaurs) was greater, but the geographic range of each type of dinosaur was smaller than at the beginning of the Mesozoic.

PROCEDURE:

1. In this exercise, the students will make a diorama that recreates a day in the life of a dinosaur. Use the following "cut outs" to help guide your students to create a diorama for each Mesozoic time period. Students may want to add other items like rocks, to make the diorama appear more realistic.

ROCK CYCLE - PAST LIFE (2B)

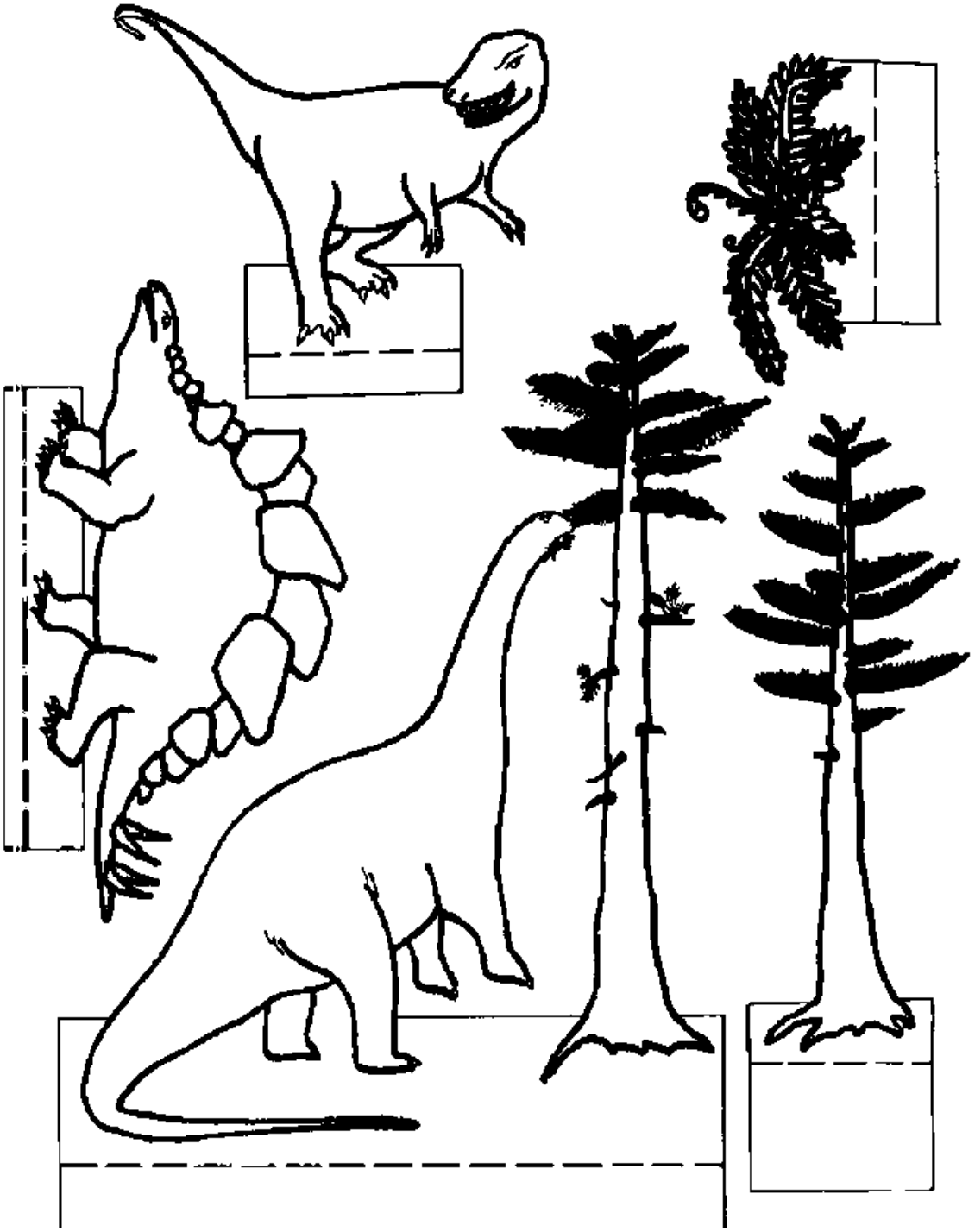
PRE LAB



Cretaceous time

ROCK CYCLE - PAST LIFE (2B)

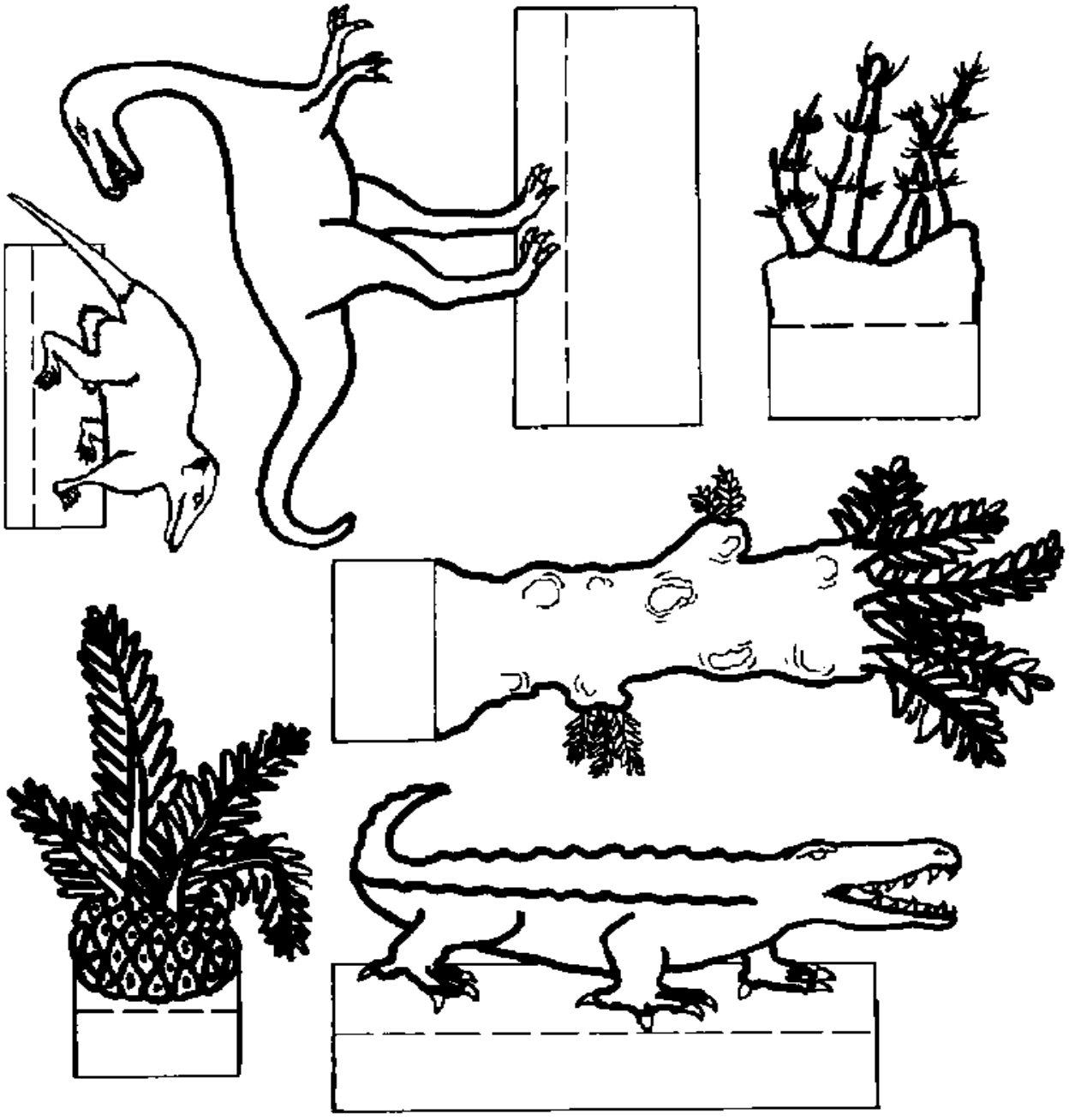
PRE LAB



Jurassic time

ROCK CYCLE - PAST LIFE (2B)

PRE LAB



Triassic time

ROCK CYCLE - PAST LIFE (2B)

Students examine rocks containing fossils.

LAB

OBJECTIVES:

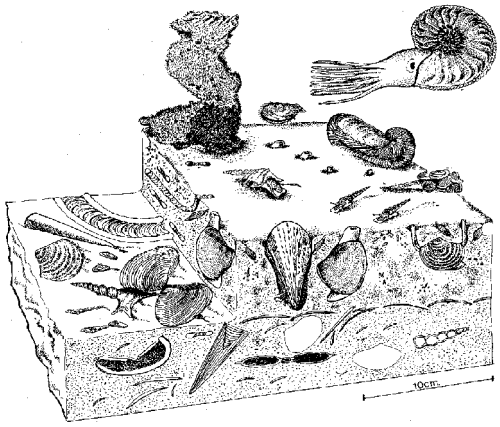
1. Discovering the components of a fossiliferous rock.
2. Learning how fossils are made.

VOCABULARY:

bivalves
fossil
gastropod
mollusk

MATERIALS:

Rock Cycle - Past Life (2B)



An example of a Mesozoic sea floor community

BACKGROUND:

Organisms have changed through time. Scientists call this documented change with time evolution. Evolution is a non-reversible process, for instance, we will never have dinosaurs again; they and many other organisms that roamed the earth eons ago are now extinct. The details of how evolution takes place are still under study, but the basic mechanism is well tested. Present day evolutionary theories are based not only on data from living organisms, but also from the remains of organisms in layers of rock.

The probability that an organism will be preserved as a fossil is low. The critters of long ago, could not go to a “Paleo-Photo Shop” to take a picture that we can use trace their ancestries. Also, consider that once an organism becomes a fossil, it just does not "hang around" for someone to find it. Geological processes such as erosion, weathering, sedimentation, leaching and many more also constantly "attack" the fossil, and may destroy the fossil before anyone sees it.

Children sometimes get the impression that fossils look exactly like the animal when it was alive. However, most fossils are not well preserved. In this lab the students will compare present day specimens with fossil specimens, and see if they can predict which present day organisms might be found in the fossil record.

PROCEDURE:

1. Have students point out some the key characteristics of the modern organism specimens. List their observations on the board, and record the information as a class. Note that gastropods or snails have one shell that spirals, bivalves (to which the clam and

scallop both belong) have two equal shells. Have the students color the clam, scallop, and gastropod on their lab sheets. Have students use a magnifying glass to look at samples.

2. After you discuss the characteristics of the clam, gastropod and scallop, have students look at the fossil samples. See if they can distinguish any characteristics that might help them decide if what they are looking at is a bivalve or gastropod. Make sure the students look at the samples very closely. Observational skills are very important in the study of fossils.

The students will discover that the fossils do not hold as much information about the organisms as their modern day counterparts. The fossils show less detail, and maybe broken or partially enclosed in rock.

ROCK CYCLE - PAST LIFE (2B) AB

PROBLEM: Is learning about living animals helpful in identifying fossils?

PREDICTION:_____
MATERIALS: snail, clam, scallop; fossil specimens

PROCEDURE: Look at each of the present day specimens and describe or draw what they look like.

Look at the fossil specimens in your sample and describe or draw what they look like.

CONCLUSION: How was it helpful to look at the present day specimens before you looked at the past life?

_____
_____

ROCK CYCLE - PAST LIFE (2B)

POST LAB

Students read a book on fossils or search the internet.

OBJECTIVES:

1. Comparing how fossils appear in the literature and the natural world.
2. Reading books about fossils.

VOCABULARY:

bone
fern
fish
fossil
scales


Dinosaur eggs

MATERIALS:

Fossils Tell of Long Ago by Aliki
Internet

BACKGROUND:

Aliki has written many children's books on fossils including *Digging up Dinosaurs*, *My Visit to the Dinosaurs*, and *Wild and Woolly Mammoths*. Her book *Fossils Tell of Long Ago*, highlights how organisms became fossils. This is an excellent story about fossils, however, it leads children to believe that they can find excellent specimens easily. This is not true. The conditions must be just right for the hard parts of dinosaurs to become fossils.

The Internet is also a rich source on fossils throughout the world.

PROCEDURE:

1. Read *Fossils Tell of Long Ago* to the students or have the children themselves read the story out loud. Ask if any of them have ever found a fossil. If not, tell them to look very carefully when they if they are ever near sedimentary rocks. Make a list on the board of the characteristics you should look for when attempting to locate fossils.

2. You may want the students to read some of the other suggested literature books. They have observed enough fossils to have become critics. Ask students to question if the author wrote about fossils correctly.

3. Have students check the following websites for more information.

University of California at Berkeley, Paleontology Museum
http://ucmp1.berkeley.edu/exhibits.html
Chicago Field Museum
http://www.fmnh.org/sue/
Royal Tyrell Museum (Canada): Dinosaur Hall
http://www.tyrrellmuseum.com
Honolulu Community College: dinosaur exhibit
http://www.hcc.hawaii.edu/dinos/dinos.1.html