SECOND GRADE
6 lessons

2

HELPING HANDS SCIENCE

Joint project
Fremont Unified School District
and Math Science Nucleus

Comments or correction please contact
msn@msnucleus.org

These are suggestions on how to use the materials with your students. The materials are set up so you can easily put out the materials. Make sure the students do not destroy materials. Many times the material can stay in the bag and a hand lens can be used for observation. Please put materials back the way you found them so all children at your school can enjoy them.

These kits have been funded in part by a grant from Fremont Educational Foundation, Lam Research Foundation, Fremont Unified School District, Math Science Nucleus and the many high school volunteers
Curriculum customized for FUSD by MSN

HELPING HANDS SCIENCE (FUSD) -SECOND GRADE

2

LIFE

Chapter	***Lab description and/or box label***	***Materials***	***Storybooks (on http://msnucleus.org)***
Plant Life Cycles	2.1 Angiosperm - Gymnosperm Life Cycle – Plants 2B	3 bags of 8 specimens (cone, fruit husk, redwood, palm tree, eucalyptus bark, Douglas fir, flower)	*What is a Tree?*
Animal Life Cycles	2.2 Animal Models - characteristics of animals	2 sets if plastic animal models	*Frog Tales*

EARTH

Rocks, Soils, and Fossils	2.3 Rocks	2 sets of igneous (scoria, granite, obsidian, pumice); sedimentary (sandstone, conglomerate, shale,mudstone; metamorphic (serpentinite, schist, marble, gneiss)	*Ricky the Rapping Rock* *Going Back through time with Dinosaurs* Dinosaurs
	2.4 Fossils	4 packets of 5 shells (moonsail, Rapana, turritella, abalone, bivalve) and 1 fossil (mollusk)	
Using Resources			*Gems* *Give Water a Second Chance*

PHYSICAL

Objects in Motion			*Gary the Gardener* Physics of Toys
Forces			
Magnets	2.5 Magnets – repel and attract	1 logo, 1 wand, 1 marble, 2 ring magnet	*Electrons and the Hairy Monster*
Making Sound	2.6 Sound - Tuning Forks	7 sets of tuning forks (2048, 1024, 640, 512, 480, 256, 100 mhz)	

ANGIOSPERM AND GYMNOSPERM – SECOND GRADE

(Life Cycle - Plants (2B)

2.1

OBJECTIVES:

Classifying broad and needle leaf trees.
Comparing and contrasting gymnosperms and angiosperms.

VOCABULARY:

angiosperm
flower
gymnosperm
pine cone
pollen

MATERIALS:

Life Cycle - Plants (2B)
worksheet

BACKGROUND:

Angiosperms produce specialized structures called flowers in which seeds develop. Angiosperms are the dominant members of the world's flora. Angiosperms are flowering and fruit producing plants. The angiosperms may be divided into the **monocots** and the **dicots**. Seeds and fruits may be variously modified, a factor that frequently assists in seed dispersal. Wind, animals, (including humans), and water are the most important agents of dispersal.

Gymnosperms produce unenclosed seeds located on the upper surface of scales, which are usually parts of cones. Most conifers are woody plants and are usually large with leaves that are usually evergreen needles or scales. Conifers are the most abundant gymnosperm today. Pines, spruce, fir, cedars, sequoias, redwoods, and yews are all conifers. Conifers cover large areas of North America, China, Europe, and Australia. The leaves of conifers are long and thin, and are often called needles. Even though the name evergreen is commonly used for these plants, it isn't accurate because needles don't remain on conifers forever.

Conifers have male and female reproductive structures called **scales**. Scales are grouped into larger structures called **male and female cones**. Male cones make male gametophytes called **pollen**. Female cones make female gametophytes called eggs. Later, the female cones hold seeds that develop on their scales. Each seed is covered by a seed coat, but the seed isn't protected by the cone. Since the seeds sit "naked," or on the outside of the scales, conifers are called naked seed plants, or gymnosperms ("gymno" means naked; sperm means seed).

PROCEDURE:

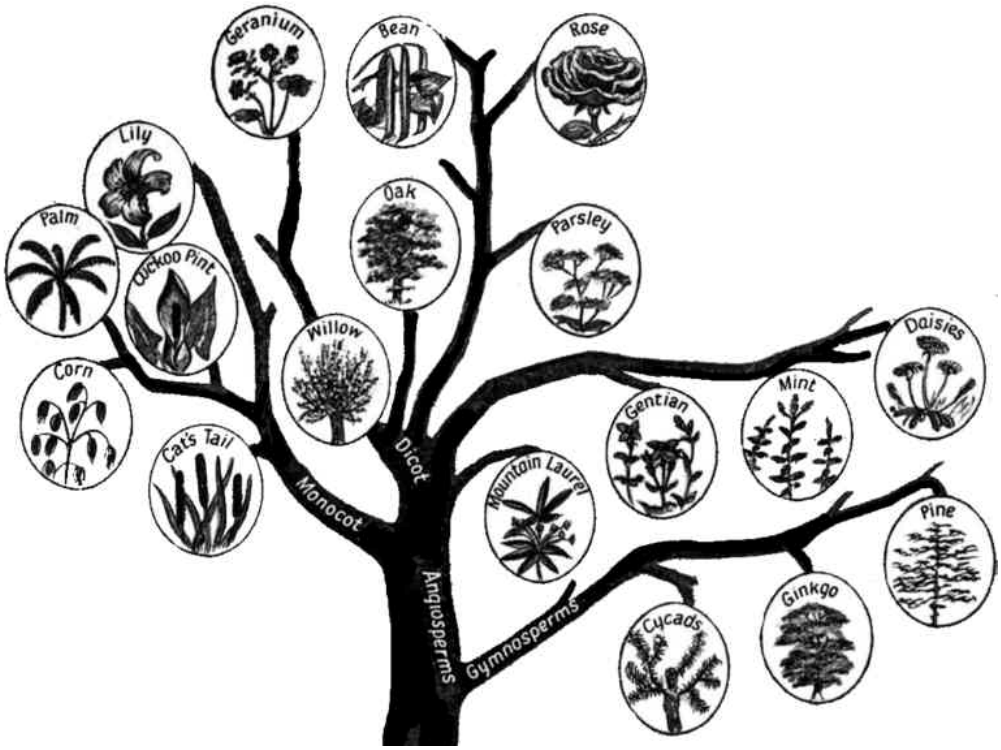
Most students are familiar with trees but may not be familiar with how to group them into angiosperms and gymnosperms. In this lab, the students will take a closer look at the different organs and tissues of each type by trying to identify them. If your school has different types of trees, you can use them to substitute for this lab.

1. Students should look at their specimens and try to identify the parts of the trees and identify whether the specimen is a seed, fruit, flower, bark, cone, or any other part of the tree.

2. Instruct students to draw their specimens on the lab sheet. If you have reference material on identifying trees this would help guide the students to do a little research. The individual type of tree is identified in the module.

3. If you have trees in a nearby area, take the students on a walk and try to identify an angiosperm (with flowers or seeds) versus a gymnosperms (with cones).

4. Draw a tree similar to the one below, that shows a tree branching into gymnosperms and angiosperms. Then show the different types. Notice that there are many more angiosperms that the children will recognize.



NAME: _____

PROBLEM: How can you distinguish gymnosperms from angiosperms?

PREDICTION:

MATERIALS: plant specimens

PROCEDURE: Draw and try to identify the part your specimen is from. Decide whether they are angiosperms or gymnosperms.

1. TYPE: Gymnosperm PART: Cone Ponderosa Pine	2. TYPE: Angiosperm PART: fruit husk (seeds inside) Liquidambar (sweetgum)
3. TYPE: Gymnosperm PART: Bark Redwood	4. TYPE: Angiosperm PART: Bark Palm Tree
5. TYPE: Angiosperm PART: Bark Eucalyptus	6. TYPE: Angiosperm PART: Seed Eucalyptus
7. TYPE: Angiosperm PART: Flower Unknown	8. TYPE: Gymnosperm PART: Cone Douglas Fir

CONCLUSIONS: What are some differences between angiosperms and gymnosperms?

ANIMAL MODELS – SECOND GRADE

2.2

OBJECTIVES:

Discovering characteristics of animals.
Comparing and contrasting different characteristics of animals.

VOCABULARY:

amphibian
bird
fish
invertebrate
mammal
reptile
vertebrate

BACKGROUND:

The vertebrates refer to the phylum called CHORDATA. Members of this phylum are our common everyday animals. All mammals, birds, amphibians, reptiles, and fish belong to this group. There are over 45,000 species throughout the world. Vertebrates have a backbone, a nervous system, and a gill slit during some stage of their life cycle. In land-dwelling vertebrates, these slits are present only in the embryo.

Mammals have distinct characteristics including: controlled body temperature, highly developed jaws, a coat or hairy skin covering, highly developed internal organs, and mammalian glands. Most important is their mode of reproduction and the way in which the young are fed on the mother's milk.

Birds are warm blooded and have a constant body temperature (with some exceptions). Birds have succeeded in conquering the air by having a very light skeleton. The beak and eyes are highly developed. They have feathers and produce eggs.

Reptiles are mainly terrestrial, but there are many living partly in the aquatic environment. The body is covered with scales or patches of horny, sometimes bony skin. Limbs are usually short or absent, feet show many variations in form. Most reptiles are oviparous, meaning that they produce external eggs. Representatives of reptiles include lizards and snakes.

Amphibians are aquatic are four limbed. The most common characteristic is an exposed, water permeable skin, rich in glands which secrete mucus, which is sometimes poisonous. Amphibians lay small round eggs protected by a gelatinous mass. Some species go through a larval stage that metamorphoses into a juvenile, for example, a tadpole changes into a frog.

There are two major types of fish, one group called the bony fishes and the other cartilaginous fishes. All fishes live in water and have external fertilization (with some

exceptions). Cartilaginous fish include sharks, rays, and lampreys. Bony include most of your present day fishes like tuna, salmon, and goldfishes.

Students are learning to **distinguish** and **describe** objects, in order to group them into larger groups. It is easy for students to group inanimate objects because they group **shape**, **color**, or **size**. Real organisms are not perfect and therefore, it is more difficult to recognize similar characteristics within groups.

Living organisms have to consider more a range of characteristics. For example, a cat could mean a house cat, a lion, a tiger, or a bobcat. Each have a cat-like look but they are very different animals. Almost all of the features have to be described. A nose, could be large, small, flat, or pointed. The nose could have large nostrils or small nostrils.

Young children need guidance is defining the ranges and descriptions of each of these characteristics. It is also important to emphasize is that scientists group organisms into assemblages with similar characteristics. This practice makes it easy to distinguish and compare various groups of similar organisms.

PROCEDURE:

1. Discuss the following vertebrates characteristics with the students. Emphasize that humans are vertebrates

- vertebrates have an endoskeleton (internal skeleton) made of bone or cartilage
- vertebrates have a body with a head and trunk and many times a neck and tail
- vertebrates have eyes, ears, and nostrils on the head
- vertebrates also contain many highly developed systems associated with their specialized organs. The systems include the muscular, skeletal, digestive, respiratory, circulatory, excretory, nervous, and reproductive systems.

3. Ask students about how we call the different animals (male, female, baby and group). Use the information below to see if students know the name of the different groups. For example, ask the students the "family" of elephants. The father is a bull, mother is a cow, baby is a calf, and a group is called a herd.

animal	Male	female	baby	group
rabbit	buck	doe	kitten	warren
fox	dog	vixen	cub or pup	skulk
bear	board	sow	cub	sloth
elephant	bull	cow	calf	herd
monkey				troop
lion	lion	lioness	cub	pride
zebra	stallion	mare	colt	herd
ostrich	cock	hen	chick	flock
penguin	cock	hen	chick	colony
sheep	ram	ewe	lamb	flock or herd
wild boar	boar	sow	piglet	herd or drove
whale	bull	cow	calf	herd
kangaroo	boomer	flyer	joey	troop or mob
bison	bull	cow	calf	herd
seal	bull	cow	pup or welp	herd or trip
giraffe	bull	cow	calf	herd

4. Provide students with bag of plastic model animals. Notice that the name is under each of the animal. Ask the students to sort their animal models into groups and go over the different animals with them. Look at characteristics that make them similar and have them sort the animals with these similarities. For example the tiger and lion are similar; mongoose and badger, anteater and scaly anteater, etc.

You have the following animal models

anteater
antelope
badger
black panther
Camel
elephant
fox
giraffe
gorilla
hippopotamus
hog boar
kangaroo
lion
Mongoose
monkey
musk ox panda
puma
polar bear
Rhinoceros
scaly anteater
tiger
wolf
Zebra

5. You may also want to have students look at the animal tracks of each animal. You may want to give students playdough. Instruct students to flatten the playdough and then make tracks of the different models. Compare the oval shape, round shape, prints with toes, and hoofs.

ANIMAL MODELS – SECOND GRADE **NAME :**

PROBLEM: How are organisms different?

PREDICTION:

PROCEDURE: USE SOME OF THE FOLLOWING WORDS TO DESCRIBE THE ANIMALS IN LAB. YOU MAY USE OTHER WORDS. ANSWER THE FOLLOWING QUESTIONS FOR EACH ANIMAL:

1. Where is the animal's nose?

2. Where are the animal's eyes?

3. Where are the animal's feet?

4. Where is the animal's heart?

WORDS THAT MIGHT HELP: slimy, wet, fur, warm, cold, big, little, webbed feet, no feet, shell, scales, lives in water, hops, makes sounds

ANIMAL	DESCRIBE

CONCLUSION: What are some characteristics to look at when comparing organisms?

ROCKS - SECOND GRADE

2.3

OBJECTIVES:

Observing the three types of rocks.
Comparing rocks.

VOCABULARY:

flat
grain
light (weight)
shiny
smooth

MATERIALS:

Rocks – Second
Ricky the Rapping Rock (under Storybooks)

BACKGROUND:

The name of a rock reflects certain **characteristics**. For example, obsidian will resemble glass and scoria will usually be dark red with holes. Rock names also refer to a texture. For example granite will have interlocking minerals and sandstone will have a gritty, sandy feel.

Young children need to experience these characteristics before they can internalize the name of a rock. They need to describe and compare the characteristics, as they learn the rock's name. Just knowing a name of a rock is not enough. In this lab, students will use their observational skills to classify rocks. Rather than using a formal classification, the emphasis is on students developing their own criteria for rock classification.

Igneous rocks come in many varieties. However, all igneous rocks began as molten rock (magma) which cooled and crystallized into minerals. Igneous rocks may look different because of two factors: (1) they may have cooled at different rates and (2) the "mother" magma (original melted rock) was of a different composition. Variations in these two factors have created many different types of igneous rocks. When the magma cools at different rates, it creates different sized minerals. Quick cooling magmas have small minerals (with the exception of obsidian, which is actually composed of silica, but has no crystalline structure). Basalt, for example, has small minerals, most of which can only be seen under a microscope. Magma that cools slowly creates rocks like granite which have large minerals that can be seen with the naked eye. Geologists classify igneous rocks based on both their crystal size and composition. The Rock Cycle has its origin in Igneous Rocks.

Sedimentary rocks form at the Earth's surface in two main ways: (1) from clastic material (pieces of other rocks or fragments of skeletons) which have become cemented together, and (2) by chemical mechanisms including precipitation and evaporation. Sedimentary rocks are usually associated with liquid water (which facilitates erosion, transportation, deposition, and cementation). However, sedimentary rocks may also form in dry, desert environments or in association with glaciers.

Metamorphic rocks are igneous, sedimentary, or preexisting metamorphic rocks that have been changed by great pressures and temperatures within the crust and upper mantle of the Earth. The temperatures were not enough to melt the rock, otherwise, an igneous rock would have formed. The pressures were much greater than those required to simply break the rocks into pieces. They were high enough to change the chemical make up of the rock by forcing the elements in it to "exchange partners."

All three types of rock make up the Earth's **lithosphere**, the outermost layer. The lithosphere averages about 100 kilometers in thickness. It is like an eggshell compared to the Earth's total radius (the distance from the Earth's core to the surface). The lithosphere is solid rock. Sedimentary rocks are the most abundant rock only on the surface of the Earth, but igneous and metamorphic are abundant deeper into the mantle.

PROCEDURE:

1. Review the three main groups of rocks. Be sure to tell them that there are many different types of rocks within each of the three groups. Brainstorm possible terms for describing rocks with the students. Read Ricky the Rapping Rock with the music. Please note that Ricky at the end changes into a Rock Star. Rock and Roll gets its name from Rocks.

2. Explain that identification and classification of an individual rock specimen is based on a variety of characteristics and criteria, and that they will start to learn some of these in this lab.

3. Give each group of students a piece of red, yellow, and black paper. Write red = igneous, yellow = sedimentary, and black = metamorphic on the board. Pass out the rock sets. Go through each of the rocks to make sure the students put the correct rock on the right color. Use the information on each rock as outlined below. You may want to give the students some clues of each rock, and then when you review the lab, you might want to add more information.

IGNEOUS

OBSIDIAN - Also known as volcanic glass. Most children recognize obsidian as the rock that many Indians used to make arrowheads. The Indians chose obsidian for the same reasons that a geologist can recognize it. It is very hard, but more importantly it breaks into sharp edges that easily cut through many materials. Note that broken obsidian looks like broken glass. Obsidian occurs in almost any color, depending on what trace elements are present in it. Black and brown obsidian are most common. Obsidian is an amorphous solid; that, it is a solid rock composed of silicon dioxide, but this material lacks crystalline structures. It is one of very few exceptions to the rule that rocks are made of minerals. The obsidian that is in your kit comes from volcanoes near Clear Lake, California. Obsidian is formed when lava is cooled very quickly; it freezes before crystals can form. Have your students try to determine which part of a lava flow will cool quickly enough to form obsidian (answer - the outer surface or "skin" of the flow).
PUMICE - Students will immediately notice that pumice is spongy or "full of holes."

This characteristic makes pumice extremely lightweight; it even floats in water (you may wish to show this to your students). It is commonly light gray to blackish-gray in color. It is easily broken and has sharp edges. Like obsidian, pumice is volcanic glass; it thus looks glassy (especially with a magnifying glass) and lacks visible minerals.Pumice forms during eruptions of magma containing large quantities of gasses, such as water vapor, sulfur dioxide, and carbon dioxide. The gas "froths" the magma as it erupts, forming bubbles. This is physically analogous to opening a soda can; carbon dioxide bubbles form in the drink as the can is opened. Like obsidian, the magma then cools quickly, preserving the bubble shapes. The gas often escapes, leaving numerous holes in the pumice. Pumice is used as an ornamental building stone. "Pumice rock" is also sold in beauty stores for cleaning dead skin cells.

SCORIA - Scoria is composed of volcanic glass and preexisting rock fragments that became incorporated into the magma as it erupted. The volcanic glass looks similar to pumice, but is reddish in color, because contains more iron than pumice. Scoria lacks large visible minerals; small ones may be it visible with a magnifying glass. Scoria is often sold as "lava rock" for use as a landscaping material.

GRANITE - Granite is composed of visible minerals, most commonly quartz, mica and feldspar. Quartz looks clear and glassy, mica is black and flaky, and the feldspars (commonly two or more different types are present) are either pale pink/orange or white in color. The relatively large size of the minerals indicates that the magma that formed the granite cooled slowly. This took place deep inside the earth, not on the surface, like pumice or scoria; it is a plutonic rock. Ask your students if they think granite is made of the same minerals as basalt (no, they cooled differently and came from a different "mother" magma). It may help to have them imagine that the minerals in the granite were tiny; would this make them dark?, (No, they would still be light colored). This indicates that rocks composed of different minerals likely have different magma "mothers." Try using the analogy that rocks are like people, no two are the same! Granite is used as ornamental and building stone.

SEDIMENTARY

CONGLOMERATE - Conglomerate consists of pebbles, gravel, sand, and boulders that have been cemented together to make a solid rock. These materials were mixed naturally in rivers or in some parts of oceans and lakes. Any type of preexisting rock can become part of a conglomerate.To explain cementation, try telling students that Mother Nature has a cement that she sometimes pours onto the beaches of lakes, oceans, and rivers. When it hardens, it becomes conglomerate, if the pieces are big, or sandstone, if they are small. In reality, the two most common cementing substances are natural solutions of calcium carbonate and silica dioxide. Crystals of calcite and quartz, respectively, precipitate from these solutions in the spaces between grains, cementing the rock together.

SANDSTONE - The gritty feel of the surface of sandstone hints that this rock was once sand that has been cemented together. Sandstones have quite varied compositions; some are composed entirely of quartz, and others are mixtures of rocks, crystals and fossils. Almost any combination is possible. Sandstones thus

come in a wide array of colors. By definition, the grains in a sandstone are "sand-sized"; most students will recognize this if you demonstrate "sand size" by showing them a bag of sand.

SHALE - Shale is composed of very small particles of mud, which have been compacted and cemented together. Individual mud grains are very small; they will rarely be visible. Shales are quite variable in color.

MUDSTONE - Mudstone is composed of very small particles (mud) that are cemented together. It can be dark to light because it is the particles that define the mudstone. But if it looks like mud….it is probably mudstone.

METAMORPHIC

MARBLE - marble is composed exclusively of large commonly visible crystals of calcite. The gray/white bands in some of the samples are due to impurities within the calcite. Marble actually comes in a variety of colors, including black, gray, white, and pink. Marble, like all rocks that have calcite in them, fizz if you put a weak acid on it (usually 10% solution of hydrochloric acid). Marble forms when a rock containing calcite in it (such as limestone) was put under high temperature and pressure conditions. Marble has been used throughout history because it is easy to break and to carve. Some marble (especially in Italy) is noted for its smooth, small crystals that make it excellent for statues. Many of the statues of Michelangelo were made from marble. Marble is also used as an ornamental building stone. If you live near or in a city, have your students try to find buildings made of marble. If you are in an old school, some of the bathroom stalls or floors may be made of marble.

SERPENTINITE - Serpentinite has a smooth, soapy feel, a green mottled color, and a somewhat flaky texture. It is composed mainly of the mineral serpentine. Serpentinite is so named because of its mottled color, which resembles the back of a sea-serpent. The geologic origin of serpentinite is still debated, but many scientists agree that it formed from a rock like basalt that was put under high temperature and pressure. Serpentinite is the state rock of California. Serpentinite is used for carving and as an ornamental building stone.

SCHIST - Schist is composed of visible minerals, mostly micas. Schists form under moderately high pressure conditions; this causes the naturally platy mica crystals to line up, giving the rock a platy look. This is a good example for illustrating the characteristic "squished" look of metamorphic rocks to your students. Have them imagine that a heavy Mother Nature sat on some rocks - look at what she did!

GNEISS - Gneiss (pronounced “nice”) metamorphic rocks look layers. During high pressure and temperature, the minerals migrate into layers. There are different types of colors and minerals that reflect the rock that has been squished.

PROBLEM: Can you identify rocks with a few characteristics?

PREDICTION:

PROCEDURE:. Add one more characteristic about the rock, so that the next time you see this rock it will be easier to identify

IGNEOUS		
CHARACTERISTIC	**NAME OF ROCK**	**LIST ONE MORE**
BLACK, GLASSY	OBSIDIAN	
HOLES, RED	SCORIA	
BLACK AND WHITE	GRANITE	
LIGHT	PUMICE	
SEDIMENTARY		
CHARACTERISTIC	**NAME OF ROCK**	**LIST ONE MORE**
BROWN, SMALL PIECES	SANDSTONE	
LARGE PIECES	CONGLOMERATE	
FLAT	SHALE	
MUD COLORED	MUDSTONE	
METAMORPHIC		
CHARACTERISTIC	**NAME OF ROCK**	**LIST ONE MORE**
GREEN, SMOOTH	SERPENTINITE	
GRAY, SHINY, FLAT MINERALS	SCHIST	
LAYERS	GNEISS	
WHITE, GRAY	MARBLE	

CONCLUSION: Can you now identify rocks? Why? What have you learned?

FOSSILS - SECOND GRADE

2.4

OBJECTIVES:

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

VOCABULARY:

bivalves
fossil
gastropod
mollusk

MATERIALS: Fossils – Second, worksheet, Going Back through Time with Dinosaurs (storybook)

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. Read “Going Back through time with Dinosaurs” to get students to see how environments change through time.

2. 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.

   If students are having problems, have them trace the outline of the organism

(on back of page) and fill in the details. Art helps students to look at detail.

3. After you discuss the characteristics of the living organisms (Mollusk: Turritella, Rapana, Moon snail, Abalone, Bivalve), have students look at the fossil sample. 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.

FOSSILS – SECOND NAME:_____

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 specimen and draw the fossils you see.

Turritella	Rapana	moon snail
abalone	bivalve	Fossil Mollusk

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

MAGNETS - SECOND GRADE

2.5

OBJECTIVES:

Exploring magnetism.
Discovering repel and attract.

VOCABULARY:

attract
magnetism
repel

MATERIALS:

Magnets – Second, pencil Electrons and the Hairy Monster

BACKGROUND:

There are only 3 metals that are naturally **magnetic** including **nickel**, **cobalt**, and **iron**. Many other metals are attracted by magnets. The magnets that are included in the kit are made of Alnico (aluminum, nickel, and cobalt, which are considered permanent magnets (i.e. does not lose its magnetism).

The more time you allow the children to discover magnets, the more they will understand on their own about the magic. Magnetism is a force that must be experienced in order to discuss it in later grades. They can now understand the power of magnetism by feeling the power of the magnets.

PROCEDURE:

1. In your module you have magnetic wands, ring magnets, and magnetic marbles. If you do not have the module, you can substitute different items. We suggest enough magnets so children can play.

2. Give each child one of each magnet, and have them discover the power of magnetism. First let them play with the items by themselves for about 10 minutes. Then let them work with a partner. Emphasize keeping the magnets away from a computer or television.

3. After they play for about 20-25 minutes, bring them together and discuss what they have discovered.

4. Hopefully students will have discovered:

   a. The magnetic wands are the most powerful. You can pick up the rings and marbles with the wand.
   b. If you put rings on a pencil in the correct way the rings will appear to float.
   c. You can play a "game" of moving the rings around by using the wands and

not touching the rings.
d. You can balance a ring on the thin side of the wand and it moves very quickly.
e. Magnetic marbles have to be arranged in a certain way to balance a stack.

5. Ask students how many elements are naturally magnetic. The only three naturally magnetic elements are nickel, cobalt, and iron. Notice that the three of them are very close on the Periodic Table. The periodic table is designed so that elements with similar properties are near each other. Iron is the weakest of all the elements; nickel and cobalt are the strongest and keep their magnetism longer. The magnets we use in this program are called ALNICO, which stands for aluminum, nickel and cobalt.

6. Use the magnets to illustrate the basic principles of magnetism, like repel and attract. If students are unfamiliar with magnets, they may need to play with the magnets before the lab.

7. Either read or have students read *Electrons and the Hairy Monster*. This book allows students to look at the similarities of magnetism and electricity. You may want to read the book as a class to make sure that students are following the connection. Key concept is both electricity and magnetism have opposites.

8. Please note that you do not have a North and South bar magnet in your kit. That would be the only way to find out what is north and south on the magnets you have. However, in the second grade most important is the feel of repulsion and attraction.

There is no lab sheet for this experiment, just play.

TUNING FORKS (SOUND) - SECOND GRADE

2.6

OBJECTIVES:

Distinguishing different types of sound.
Experimenting, recording and interpreting data.

VOCABULARY:

experiment
frequency
interpret
pitch
sound
vibrations

MATERIALS:

tuning forks (2048, 1025, 640, 512, 430, 256, 100 mhz recommended but can vary); tray with water

BACKGROUND:

There are two major types of waves, physical waves and electromagnetic waves. Sound waves are physical because they actually have a physical motion in the surrounding area. Light is an electromagnetic wave which will be discussed in detail in the 5th grade physics lesson. Waves represent a mechanism whereby energy is transmitted. Sound is heard because of vibrations. Vibrations are a disturbance of the air space that mechanically moves the air. Sound cannot travel in a vacuum because there is no medium. Sound travels in a push-pull or compressional type of manner. Introduce the word "pitch." A pitch is the "highness" or "lowness" of a tone, governed by frequency.

High frequency equals a high pitch sound, while low frequency equals a low pitch sound. When a rubber band is stretched a little and strummed, it will cause little vibrations and a low pitch. If you stretch the rubber band further and strum it, they will have created a higher pitch.

PROCEDURE:

1. Please note you have 7 different types of tuning forks. The students will exchange the different forks to see the difference for the second exercise.
The first exercise they could use any of the tuning forks. The lower numbers will give better results, but not important to the overall experiment.

2. In the first experiment, students will establish that sound needs a medium to be transferred. Students are asked to see if the sound produced by a tuning fork can be felt or heard by hitting the tuning fork and touching it to the nose, hand, paper, pencil, and tray of water.

3. Students should feel a "tingling" feeling when the tuning fork's tines touch their bodies. The nose is the most sensitive. The pencil will just vibrate. The papers should give a humming sound. The vibrating tuning fork sets up vibrations in the water. The spot where the tuning fork hits the water is similar to the focus of an earthquake or the point where a pebble enters the water.

4. In the next activity, students are asked to look at each of the 7 different types of tuning forks to see if the wave that is generated is different. Tell the students to gently hit the tines of the tuning forks and put it just on the surface of the water. They do not submerge the tuning fork. You may want to have them practice the touching. Depending on how many students in your group, have each child try it. They should record their observation on the lab sheet. There should be a difference in the distance between the rings.

5. Students have learned that sound is a physical wave and is transmitted through substances in different ways.

TUNING FORKS (SOUND) - SECOND GRADE

PROBLEM: How can you determine if sound is a physical wave?

PREDICTION:

PROCEDURE:
MATERIALS: tuning forks, tray of water

EXPERIMENT I. Gently hit the tines of the tuning fork on a hard surface (back of hand or wood) and touch the tines to the items listed below. Record what happens and see if you can hear the tuning fork.

ITEM	WHAT HAPPENS	CAN YOU HEAR
nose		
hand		
paper		
pencil		

EXPERIMENT II.

Mhz	Describe or draw (see if you can observe difference)

CONCLUSIONS: Do the above experiments illustrate that sound is a physical wave? What else did you learn?