THIRD GRADE
6 lessons

3

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) - THIRD GRADE

3

LIFE

Chapter	***Lab description and/or box label***	***Materials***	***Storybooks (on http://msnucleus.org)***
Adaptations to Land and Water	3.1 Ocean Critters -organisms	Life Cycle – Organisms 4B Sets of porifera, coral, clam,mussel, scallop, snail, sea cookie, seastar, sea urchin, barnacle	*Simona's Adventures in Eritrea, Africa*
Environments change	3.2 Carnivore versus herbivore	Life Cycle – Natural Environment 3A (3 sets of Babylonia, Murex, Rapana, Delphinula, Turritella, Sundial, and Land snail)	*Murder in the Mud*
Organisms of Long Ago			*Mammoth Mary*

EARTH

Solar System	3.3 Moon - surface of moon and how it fits into the Earth moon system	10 Moon photos (original Apollo 1967 mission)	*How many planets?* Searching the Universe *Mugambi's Moving Moon*
Cycles and Patterns of Space	3.4 Stars and Constellations – looking at the night time sky	Constellation placemats 10 Star and Constellation placemat	*Constellations* *Bear and Baby* *Hercules* *Beep, Beep*

PHYSICAL

Properties of Matter			
Chemical Changes	3.5 Elements – periodic table and looking at elements	10 stations, 1 each of Zinc, iron, aluminum, sulfur, copper, tin, nickel, carbon lead, silicon	Rock Cycle (slideshow – beginning slides)
Forms of Energy			
Light	3.6 Light – Reflection an Refraction	8 stations of one each: 3-D mirascope, periscope, prism, small telescope, teleidoscope, mirror, biconvex lens, Minimizer	*Light Magic* Light Magic

Ocean Critters - Third Grade

[Life Cycle - Organisms (4A)]

3.1

OBJECTIVES:

Classifying invertebrates. Comparing invertebrates.

VOCABULARY:

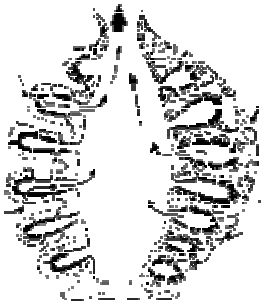
Arthropoda
Cnidaria
Echinodermata
Mollusca
Porifera

MATERIALS:

Life Cycle - Organisms (4B)

BACKGROUND:

There are five phyla represented in this lab: **Porifera**, **Cnidaria**, **Arthropoda**, **Mollusca**, and **Echinodermata**. The students should discover the characteristics described below. After the lab is completed discuss the following characteristics.

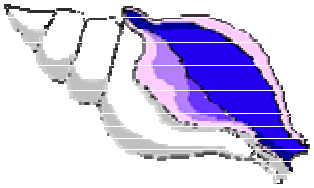


PORIFERA (SPONGE): This soft, porous specimen represents a very primitive invertebrate. Sponges that are used today for cleaning are synthetic. However, if you look at a synthetic sponge, you notice that it looks like a real sponge. In the early days, people used sponges for soaking up water.

Water containing nutrients, enters pores of sponges. Waste is released through larger openings called "oscula." Look for the different size openings on the specimens.

CNIDARIA (CORAL): Cnidaria are organisms with a central stomach surrounded by stinging cells on the end of finger-like projections. This phylum includes jellyfish, sea anemones, and corals. Coral heads are the skeletal remains of living corals. They are rough in texture and come in a variety of shapes, sizes, and colors. Corals are classified as soft and hard corals. The coral samples you see have tiny holes which once contained a single organism.

Examples from this phylum have holes, rough textures, radiating walls or branches, and are mostly white when dead. Coral may form large reefs, like the Great Barrier Reef in Australia, which serve as homes and shelters for fish and other sealife.



MOLLUSCA (CLAM, MUSSEL, SCALLOP, SNAIL): Specimens

from this group of invertebrates have hard shells, curved or twisted bodies, one or two shell parts, and an unsegmented body. Many animals from this phylum can be found at stores or seafood restaurants as clam chowder, seafood platters, or escargot.

ECHINODERMATA (SEA COOKIE, SEASTAR, SEA URCHIN): This phylum consists of animals that have a 5-arm pattern, sometimes brittle bodies, and circular holes that allow the entrance and removal of food and waste. One example, the familiar seastar, can grow back body parts that are cut off or lost.

ARTHROPODA (BARNACLE): This phylum consists of segmented or jointed invertebrates including insects, spiders, and crustacea. A barnacle is a shrimp-like arthropod with a shell. Students will not be able to see the arthropod itself, only the shell that houses the organism when it is alive.

PROCEDURE:

1. Students will examine specimens of invertebrates in this lab activity. Invertebrates are animals that lack a backbone and comprise 95% of the Animal Kingdom. Discuss techniques on observing the specimens using the senses of touch, sound, and sight.

2. Students should determine which samples belong together by describing characteristics such as texture, shape, growth patterns, hardness, and color. Each of the specimens is an individual species. Emphasize with students that there are many other species within these groups.

NAME _____

PROBLEM: How do we group species into larger groups?

PREDICTION:

MATERIALS: packets of organisms (10 – use the back of page to complete)

PROCEDURE: You have different organisms in your packet that represent different species. Classify the organisms into large groups (Phylum) using characteristics that might link the individual samples. Draw the specimens and label the characteristics they have in common. (Hint: there are 5 major groups).

Name	CHARACTERISTICS	DRAWING

CONCLUSION: What were some of the characteristics that you used to sort these samples into groups?

HERBIVORES VS CARNIVORES

3.2

OBJECTIVES:

Discovering the food chain of gastropods.

Comparing herbivores and carnivores.

VOCABULARY:

carnivore
herbivore

MATERIALS:

Life Cycle – Natural Environment (3A)

STORYBOOK:

Murder in the Mud

BACKGROUND:

The marine environment has many different environments where organisms can live. There are **consumers** as well as **producers**, including **carnivores**, **omnivores**, and **herbivores**.

The **marine** environment has physical conditions that change like those in the **terrestrial** environment. The conditions, however, are different and include water temperature, salinity, ocean currents, depth, and nutrient supply. Plants can only live in the upper 200 meters of water, because light cannot penetrate any further. The farther you go down in water depth, the more you will only find consumers. The ocean environment is very complex.

The **gastropods** are a very large group within the **Phylum Mollusca.** The group includes the conches, periwinkles, limpets, garden snails, and slugs. Most gastropods have shells, generally in the shape of a spiral with numerous turns. Virtually every type of feeding habit is exhibited by gastropods. Larger bottom dwelling carnivore gastropods burrow into the sand to reach their prey including volutes, bonnets, helmets, olive shells, harp shells, and whelks. Some species in these groups smother the victims with their feet. Some may grip the bivalve with the foot, pulling, or wedging the two valves apart with the edge of the shell. Some are adapted to drill holes in the shells.

The living gastropod has a distinct head with a mouth, eyes and tentacles. Most have an organ in their mouth area called a **radula,** a series of rows of minute teeth on a flexible piece of flesh with which they scrape up food, tear the flesh of prey, or bore holes in the shells of clams. Gastropods may be **plant-eaters**, **carnivores**, **scavengers**, **deposit-feeders** (obtaining food particles from sediment) or **suspension-feeders** (straining suspended food particles from the water. It is very difficult to

determine if a snail is a herbivore or carnivore by looking at its shell. Gastropod shells display an infinite variety of colors, patterns, shapes and sculpturing. There is one clue that works most of the time when trying to determine if a snail is a herbivore or carnivore, by looking at the **siphonal notch** area of the shell.

PROCEDURE:

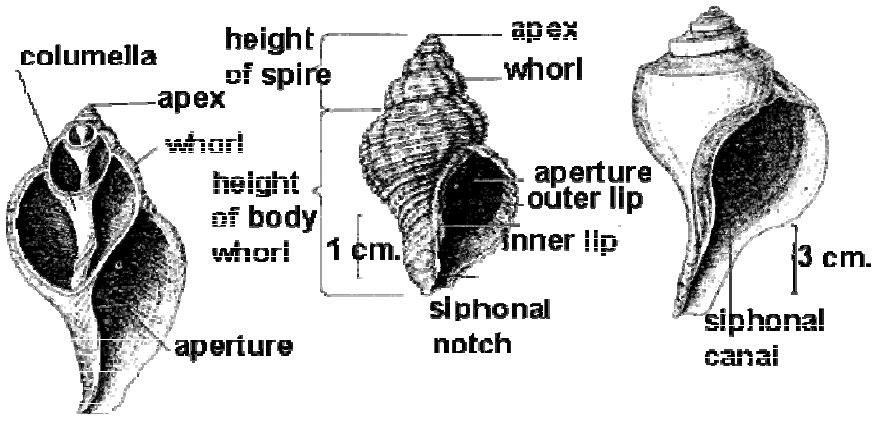
1. Make students realize that the oceans are not one homogeneous mass of salt water. The marine environment has many biomes and niches, just like the land environment.

2. Go over the diagram of a snail with students because the slight modification of the **siphonal notch** will give students clues on how to determine if a snail is a herbivore or carnivore.

   If the notch is indented it is usually a carnivore, if there is no indentation it is usually a herbivore. Of course, there are exceptions, but that is where books like the *Audubon Pocket Guide to Familiar Shells* can help. On the lab sheet, students will describe the shells using the model shell picture as a guide. Instruct student to determine if their shells are from a herbivore or carnivore.

3. In the lab, students will look at their packets and determine which marine snails are herbivores or carnivores. Remember it is important to have the students carefully observe the characteristics, then to get the correct answer.

   Babylonia formosae - carnivore
   Murex endiva - carnivore
   Rapana tomisiana - carnivore
   Delphinula sp. - herbivore
   Turritella sp. - herbivore
   Sundial - herbivore
   Land snail - herbivore



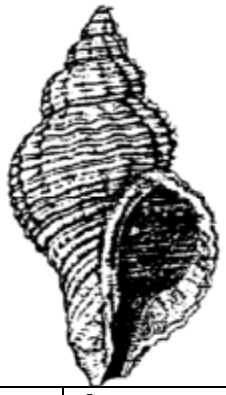
HERBIVORES VS CARNIVORES Name

PROBLEM: Can you determine how a gastropod eats?

PREDICTION:

MATERIALS: package of shells

Determine how the specimens differ by comparing them with the pictures below. State whether you think the shell came from a carnivore or herbivore. Draw the different shells and label the major parts. (use back of page for more room)



Name	Describe	draw

CONCLUSION: How can you determine if a snail is a herbivore or carnivore?

STARS AND CONSTELLATIONS - THIRD GRADE

3.3

OBJECTIVES:

- Comparing and contrasting constellations.
- Analyzing the geometric patterns of constellations.

VOCABULARY:

- constellation
- galaxy
- star

MATERIALS:

- Constellation placemats
- Constellations (storybook)
- Bear and the Baby, Hercules (storybooks)
- Searching the Universe (slideshow)

BACKGROUND:

The Universe is a vast space of unknown dimensions. The Milky Way is our address in the Universe. Our Sun is only one small component amongst the other billions of stars in our galaxy, the Milky Way. The Solar System is a group of 9 planets that revolve around the Sun.

We see objects in the night sky because they are either generating or reflecting light. While these objects also shine or reflect light during the day, we generally cannot see them because they are much dimmer than the bright light emitted by the nearby Sun.

Most of the light we see at night comes from within our own galaxy, the Milky Way. Some points of light, however, are from other galaxies or nebulas, which are glowing clouds of gas within our galaxy.

When ancient people looked in the night sky, they noticed groups of stars which formed images of animals, gods, and heroes. In the silence and darkness, ancient humans started to tell stories to one another for entertainment. The students will look at two constellations in the lab: Orion and the Big Dipper.

Orion was a hunter who was killed by a giant scorpion. He was placed in the sky but was still chased by the scorpion, which is found in a constellation (Scorpio) on the other side of the sky. When Orion is visible, the scorpion is below the horizon. When the scorpion rises, Orion sets, so that they are never visible at the same time. The Big Dipper is actually part of the Ursa Major (Big Bear) constellation, and represents a cup with a long handle.

These points of light in the sky, and the shapes they represented, were also important for traveling at night and for determining the time of the year. The constellations, as they are now called, helped to guide the early people in many ways.

Many are familiar with constellation of the zodiac. The zodiac is an imaginary belt in the heavens, usually between 18 degrees of the celestial equator, that encompasses the apparent paths of the principal planets of the Solar System, except for Pluto. Within this belt there are 12 constellations that are referred to as the Constellations of the Zodiac. They are used when we talk about the astrological sign we were born under. For example, if you are born at the end of January to mid February, your sign is Aquarius, the water bearer. But there are many more constellations than just the zodiac constellations.

Today astronomers use 88 constellations to divide the heavens into units which help us locate other objects. It also tells something of the ancient peoples who looked up into the night time sky. The stories behind the constellations were created by "story tellers" within tribes of people.

PROCEDURE:

1. Ask the students which objects make their own light. Stars generate light because they are giving off energy. Ask them which star is closest to us. If they do not know, explain that it is our own Sun. Tell them that stars are like our Sun, but very far away. Show pictures of different types of stars, and say that our Sun is only a medium size star.

2. Explain that patterns of stars are called constellations, and that there are stories about some of these groups. Astronomers now use 88 constellations to help divide the Universe into areas. Scientists use these to help locate components in that sector. So the term constellations can mean a historical grouping of stars with stories and myths associated with them, or as a way to locate an area on a Celestial Globe.

3. Remind students that constellations are groups of stars that form a pattern. Children see the sky as a flat object, like a ceiling. The three dimensional concept of different distances in space needs to be explained to students.

   Show students the Constellation Placemat and go over some of the arrangements that you might see in the night sky. Students already would have seen the celestial model and the celestial globe, so this is another representation of the night sky.

4. Early people would look into the night sky and wonder what was in "outer space." They developed stories on the groups of stars. Astronomers today use 88 constellations to divide up the heavens. These areas contain the traditional constellation for which it is named.

5. Read "The Bear and the Baby" an animated version of the Roman myth on how Ursa Major and Ursa Minor got into the heavens. You may also want students to read “Hercules.” This myth has many characters that are also constellations.

6. Explain to students that the Big Dipper is part of the Ursa Major constellation. However, the Big Dipper is not a constellation. It is referred to as an asterism, or an arrangement within a constellation.

7. Play the Constellation Song so students can visualize the constellations.
8. Use the questions below to get students to look at the constellation placemat. You may want to include your own questions for the students to find (either a star or a constellation). May want to make a game with the winning table getting a point and the most points win.

   a. What map shows the stars in our hemisphere? Northern

   b. What map would people from Australia look at? Southern

   c. Do we see the same sky? No

   d. What is the center of the Northern Hemisphere? Name the constellation and the star. Ursa Minor; Polaris Southern Hemisphere? Is the southern cross, on placemat called “Crux”

   e. Which way does the northern hemisphere rotate? Counterclockwise; Southern hemisphere rotate? Clockwise

   f. Find the Milky Way in the Northern Hemisphere? Band of light purple; What are we looking at when we look in that direction? We are looking toward the nucleus of the Milky Way galaxy, toward the center.

   g. Find Betelgeuse (pronounced beetle juice). Is it a bright star? Yes (its diameter is from our sun to Earth…. Very large star. What constellation is it in? Orion (the Hunter)

   h. Provide each student with their sign of the zodiac. Have the students try and determine where the signs of the zodiac can be found? ….are they mainly in the northern or southern hemisphere (northern, but many can be seen in the southern)

   The constellations in the Zodiac are the following:

   CAPRICORNUS - December 22 - January 19
   AQUARIUS - January 20 - February 18
   PISCES - February 19 - March 20
   ARIES - March 21 - April 19
   TAURUS - April 20 - May 20
   GEMINI - May 21 - June 20
   CANCER - June 21-July 22
   LEO - July 23 - August 22
   VIRGO - August 23 - September 22
   LIBRA - September 23 - October 22

SCORPIO - October 23 - November 21
SAGITTARIUS - November 22 - December 21

About 8 degrees north and south of the ecliptic (a band across the sky between the highest (summer) and lowest (winter) point of the Sun's apparent path) there are 12 constellations called the zodiac. Because of the Earth's motion around the Sun, the Sun appears to pass in front of each zodiacal constellation once per year, always in the same order. For example, the Sun is at Pisces at the beginning of spring and then moves through, Aries, Taurus, and so on.

The zodiac constellations serve as reference points to astronomers when investigating the Universe. However to astrologers, the zodiac constellations, as well as the motions of the planets, were signs believed to influence the behavior and lives of people (i.e., finances, relationships, moods, friendships). There is no scientific basis for these interpretations.

LIST OF THE 88 CONSTELLATIONS

ANDROMEDA (Princess)
ANTLIA (Air Pump)
APUS (Bird of Paradise)
AQUARIUS (Water Bearer)
AQUILA (Eagle)
ARA (Altar)
ARIES (Ram)
AURIGA (Charioteer)
BOOTES (Herdsman)
CAMELOPARDALIS (Giraffe)
CANCER (Crab)
CANES VENATICI (Hunting Dog)
CANIS MAJOR (Big Dog)
CANIS MINOR (Little Dog)
CAPRICORNUS (Sea Goat)
CARINA (Keel of Ship)
CASSIOPEIA (Queen)
CENTARUS (Centaur)
CEPHEUS (King)
CETUS (Whale)
CHAMAELEON (Chameleon)
CIRCINUS (Compass)
COELUM (Graving Tool)
COLUMBA (Dove)
COMA ABERENIES (Bernice's Hair)
CORONA AUSTRA. (Southern Crown)
CORONA BOREALIS (Northern Crown)
CORVUS (Crow)
CRATER (Cup)
CRUX (Southern Cross)
CYGNUS (Swan)
DELPHINUS (Dolphin)
DORADO (Swordfish)
DRACO (Dragon)
EQUULEUS (Horse)
ERIDANUS (Po River)
FORNAX (Furnace)
GEMINI (Twins)
GRUS (Crane)
HERCULES (Hercules)
HORROLOGIUM (Clock)
HYDRA (Sea Serpent)
HYDRUS (Water Snake)
INDUS (Indian)
LACERTA (Lizard)
LEO (Lion)
LEO MINOR (Little Lion)
LEPUS (Hare)
LIBRA (Balance)
LUPUS (Wolf)
LYNX (Bobcat)
LYRA (Harp)
MENSA (Table Mt.)
MICROSCOPIUM (Microscope)
MONOCEROS (Unicorn)
MUSCA (Fly)
NORMA (Level)
OCTANS (Octant)
OPHIUCHUS (Serpent Holder)
ORION (Hunter)
PEGASUS (Winged Horse)
PAVO (Peacock)
PERSEUS (Perseus)
PHOENIX (Legendary Bird)
PICTOR (Easel)
PISCES (Fishes)
PISCIS AUSTR. (Southern fish)
PUPPIS (Stern of Ship)
PYXIS (Compass of ship)
RETICULUM (Net)
SAGITTA (Arrow)
SAGITTARIUS (Archer)
SCORPIUS (Scorpion)
SCULPTOR (Sculptor's tools)
SCUTUM (Shield)
SERPENS (Serpent)
SEXTANS (Sextant)
TAURUS (Bull)
TELESCOPIUM (Telescope)
TRIANGULUM (Triangle)
TRIANGULUM AUS. So. (triangle)
TUSCANA (Toucan)
URSA MAJOR (Big Bear)
URSA MINOR (Little Bear)
VELA (Sail of Ship)
VIRGO (Virgin)
VOLANS (Flying Fish)
VULPECULA (Fox)

THE MOON -THIRD GRADE

3.4

OBJECTIVES:

Observing craters on the surface of planets and moons.
Speculating on the origin of craters in the Solar System.

VOCABULARY:

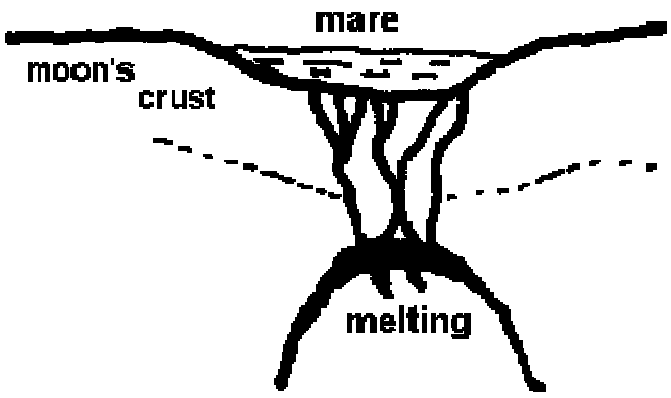
craters
mare
rays
rills
satellite photograph

MATERIALS: optional (only if you are showing how craters are built (flour, corn meal, spoons, newspaper, measuring sticks, pans)

magnifying glasses
photos of the moon
Worksheet (optional)
Mugambi's Moving Moon (storybook)
Searching the Universe (slideshow)
How many planets? (storybook)

BACKGROUND:

The surfaces of the terrestrial planets are covered with impact craters, except for the Earth. Many of the Solar System's moons also have many craters. Impact craters form when a meteorite strikes the surface. The impact hits with so much force that it compresses the rock it strikes, forming the crater. The impact also vaporizes the impacting object. This impact plus the rebound of the compressed rock ejects material out of the crater. This material may spread up to thousands of kilometers away, depending on how much energy is released. The shape of the crater may change if its walls begin to slump inward, partially filling it up as shown in the figure to the left.



Craters may also be destroyed by surface processes, such as weathering, and flows of water, wind, and ice. This is why craters are rare on Earth. Old craters have been destroyed.

Our understanding of the origin of craters was limited until pictures and samples were returned from our own Moon's surface. We now have good photographic evidence for craters from the other terrestrial planets, especially Mars and Venus. Craters on these planets are difficult to interpret; some scientists think that some of them may be volcanic in origin.

On the Moon, the floor of a typical crater is below the average level of the surface. The crater is surrounded by a raised rim. Ejected material appears as piles of rubble or loose rock in a zone around the crater, or from larger craters, as a system of rays. Some craters are cut by rills, which are cracks in the surface. Rills may be faults, possibly caused by ancient tectonic activity or cooling processes.

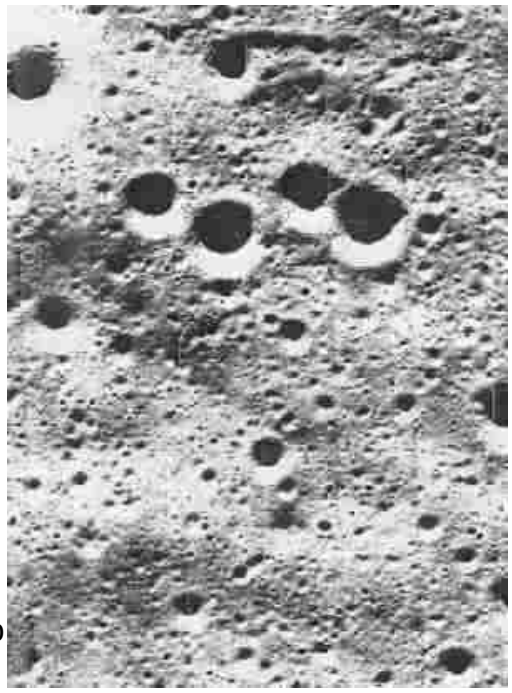
Some very large lunar impact craters are filled by volcanic rock very similar to the terrestrial igneous rock basalt. These filled craters are usually called *mare*, from the Latin word for ocean. Scientists suggest that after a large impact, molten rock leaked up from the interior of the Moon along cracks, partially filling the crater.

In this activity the students first make their own craters, and then observe real craters using pictures from the lunar surface.

PROCEDURE:

1. Read "Mugambi's Moving Moon" and discuss that the Moon is the same all over the world. At one time we had no idea of what it was made of, until the 1960's when we actually landed on the moon.

2. Explain how craters form to the students. You may wish to draw the diagrams shown in the background information to help. Explain the probable origin of lunar mare to the class. Again, you may wish to draw the diagram above on the board. Tell the student that they are going to make craters, and then look for real craters on the Moon.



3. (Optional) Have the students work in groups. Have the students follow the directions on the lab sheet, or if you prefer, assemble the crater materials in advance. If you do not have the materials, have students do the first part as homework. It is important that they experiment with craters to get the "feel" for how craters make an impression.

   Pour flour into each pan and level it into a layer at least 4-5 cm thick. Have the students work outside or spread newspapers on the classroom floor. Have each student stand on a chair and drop a spoonful of flour into the pan from a height of about a meter. This will form mini-craters in the flour that have the same raised rims and sloping sides as real craters.

If you have corn meal, you may want to mix that in with the flour. It gives the crater a more defined rim.

Alternatively, you may want to make several craters with a few students, and have the rest of the class observe and record the craters on their lab sheets.

4. You can also experiment by changing the angle of impact, by throwing the flour into the pan at an angle. This is how most "real" craters form; rarely if ever does an object strike exactly perpendicular to the Earth's surface. Be careful, angled impacts can be messy! You should see, that unless the impact angle is very shallow, a circular crater is created. You may want to discuss with students that impacting objects do not hit the Earth straight on.

5. Give students a Moon photographs. These are from the Astrogeology Unit of the U.S. Geological Survey. They were actually used in the late 60's to 80's to map the moon. This was a long and tedious process. Give each student a magnifier. Have them look at each of the four pictures to try and determine which ones show craters and which ones do not. Have them count the number of craters on each photo, and record the information on their lab sheets.

   Have the students try to detect the difference between a mare and an impact crater. This is actually hard to see. You may wish to hint that the very large craters are usually mare. Instruct the students to look at the shadow. They may be able to tell the difference between a hill and a depression. But this is difficult also. Shadows and just a good eye can help you determine. It is good for the students to see the difficulty in this interpretation. Facing ambiguity is an important part of doing science.

PROBLEM: How do craters form on the surface of a planets or moon?

PREDICTION:

EXERCISE 1: (optional)
MATERIALS: pan, flour, spoon, measuring stick

PROCEDURE: Put flour in a pan, making a layer 4 to 5 centimeters deep. Level the top of the flour layer. Take your pan outside, or if you work inside, put the pan on top of a sheet of newspaper. Stand on a sturdy chair, so your hand can be about 1 meter above the pan. Drop a leveled spoonful of flour into the pan. You and your partners should do one "drop" each. Look at the flour in the pan. Describe and draw the crater that you have created.

Describe the shape and size of the crater you created.

On the back of this page draw the crater you made.

EXERCISE II:
MATERIALS: photographs of the Moon, magnifying glass

PROCEDURE: Look at the photos of Moon with the magnifying glass. In the space below, record the number (#) of impact craters, mare, mountains. Also describe the landscape. Work as a team. Make sure everyone knows what they are looking for and figure out how to count the object.

# IMPACT CRATERS	# MARE	# MOUNTAINS	DESCRIBE THE LANDSCAPE

CONCLUSION: Is it difficult to determine the nature of craters? Explain your answer.

ELEMENTS - THIRD GRADE

3.5

OBJECTIVES:

Comparing the states of matter.
Analyzing the periodic table of the elements.

VOCABULARY:

element
gas
liquid
matter
periodic table
plasma
solid

MATERIALS:

Periodic Table Placemats

BACKGROUND:

All "things" in the Universe can easily be classified as either solids, liquids, gases, or plasma. A solid is a state of matter with a boundary to its volume and shape. A liquid's shape and volume is defined by the container it is in. A gas can take on the shape and volume of the container that encloses it and can expand indefinitely. A plasma refers to matter that is composed of electrically charged particles. Plasma is very abundant in the Universe. The best way to illustrate these states of matter is to use examples. A book is solid, water is a liquid, air is composed of gases, and the "light" in a fluorescent lamp is plasma.

A fifth state of matter has recently been confirmed. This new state of matter is called the Bose-Einstein condensate. This state of matter is only observed under extreme cold temperature. It seems that under these temperatures the different elements and compounds act very strange, some even seem to levitate! Scientists do not know all there is about this state of matter, but it is a good example of how our understanding of science changes with new information.

In our everyday world, we are see and use "elements" in many ways. Advertisements talk about, "Iron is needed for our blood" or "Silicon Valley." Unfortunately, not all references to elements are scientifically accurate. For instance, lead in a pencil is not the element lead, but the mineral graphite which is composed of the element carbon. A five cent nickel only has a small percentage of the metal nickel in it. The calcium in milk is not the element calcium, just a small percentage of calcium is contained in the chemical composition. Elemental calcium is a silver white metal and is very reactive.

The elements are grouped into units that have similar properties. For example elements 2,10,18,36,54, and 86 are classified as "rare or inert gases." Notice also that the colors on the periodic table refer to groups of elements that have similar characteristics. If an element is found naturally not in combination with other elements it is called a native element or native mineral.

Most of the "elements" that we are exposed to in advertising are really combinations of elements (compounds). In this exercise the students will learn the characteristics of certain elements. Please note that some of the items may not be 100% pure, but they still exhibit to students the characteristics of that element in its pure state.

PROCEDURE:

1. Go around the room and have students identify substances as being solid, liquid, gas or plasma. Make a list on the board. A solid could be a table or pencil; a liquid could be water or blood; gas could be air or helium; and plasma could be a fluorescent bulb or the plasma ball. You will not be able to find any examples of Bose-Einstein condensate.

2. Tell your students that matter is made of elements. Some elements are natural (90), others elements are man-made (19). Most substances that your students are familiar with are made of these elements. The elements can be solids, liquids, or gases. None of the natural elements are in a state of plasma on Earth.

3. Give students a Periodic Table Placemat and have them look at the symbols. The Periodic Table is a "handy dandy" guide to all the elements. Remember, the Periodic Table was developed to be looked at as reference material, not something that was meant to be memorized. Once you learn how to use the table, it can tell you many things about the elements. You might want to point out the following elements that the students may be familiar with:

   H = hydrogen, a gas
   He = helium, a gas
   Ca = calcium, a solid
   Si = silicon, a solid
   Au = gold, a solid
   U = uranium, a solid
   Ag = silver, a solid
   Hg = mercury, a liquid

4. Students love to find elements on the Periodic Table. You can make a racing game out of finding the elements by asking students to raise their hands when they find a certain elements. They should have to be able to tell you the element's atomic number when you call on them.

5. Tell the students that today they will be looking at some of the elements found on the Periodic Table. These elements are either found in nature or manufactured (silicon). As they look at the samples tell them that they will need to use words to describe them. Practice words that describe something

(color, texture, etc.).

6. Pass out the student lab sheets. As students look at the samples and try to find both the atomic symbol and the atomic number of the element using the periodic table. They will learn in later grades that the atomic numbers refer to the number of protons the element possesses. Ask them to record this information in the appropriate boxes on the lab sheet.

7. After they complete this, ask them to describe the minerals in descriptive words. Record these in the box on their lab sheet.

   COPPER - copper color, used to make pipes, teapots, etc (native mineral)
   NICKEL - gray color, used to make nickels and metal, naturally magnetic
   LEAD - gray color, used to make metals, flexible, heavy
   SILICON - white or gray color, used in computer industry to make computer chips
   CARBON - gray color, used in making pencils, rubs off easily
   SULFUR - yellow color, used in making medicine, (native mineral)
   ALUMINUM - gray color, used to make aluminum foil and other metals
   IRON - gray color, used in the steel industry, and has other uses as a metal
   ZINC - gray color, used as metal
   TIN - gray color, shiny, bends, used as a metal

PROBLEM: How can you tell the difference between elements?

PREDICTION:

ELEMENT	ATOMIC SYMBOL	ATOMIC NUMBER	DESCRIBE
COPPER			
NICKEL			
ZINC			
SILICON			
CARBON			
SULFUR			
IRON			
ALUMINUM			
LEAD			
TIN			

CONCLUSIONS: Can you tell what the element might be used for by looking at its characteristics?

LIGHT - THIRD GRADE

3.6

OBJECTIVES:

Discovering the components of light.
Observing and explaining optical illusions.

VOCABULARY:

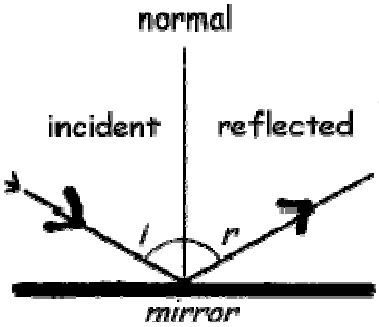
illusion
prism
reflection
refraction

MATERIALS:

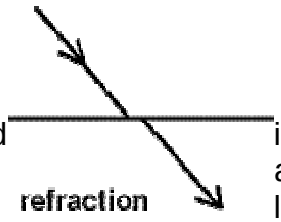
- Light – Third (3-D mirascope, periscope, prism, small telescope, teleidoscope, mirror, biconvex lens, Minimizer
- Light Magic (slideshow)
- *Light Magic* by J. Blueford

BACKGROUND:

Emphasize that this segment concentrates on visible light which is a part of the electromagnetic wave spectrum. Review how light carries energy in tiny packets of electromagnetic radiation called photons. Light travels at 296,000 meters per second or 186,000 miles per second and doesn't need a medium to travel in. All colors of light travel at the same speed, but they have different wave frequencies (short and long waves).



Light can be reflected or refracted. In reflection, light bounces off a surface and is diffused. Light travels in a straight line and refraction is the bending of this light. The light breaks up into different frequencies therefore causing a rainbow or a "broken" look.



This activity demonstrates different components of refracted light. If students do not know the light spectrum, give them the following pneumonic device to help them remember. ROY G. BIV = red, orange, yellow, green, blue, indigo and violet.

PROCEDURE:

1. Read *Light Magic* to students if they need a quick review of properties of light. Light Magic slideshow may also be useful.

2. Put the materials out and have students spend about 2-3 minutes per station

3. Students will look at specimens and decide whether they are causing an image by reflection or refraction. On the lab sheet they will describe the image.

4. **3-D mirascope** – REFLECTION light goes into the opening, reflects off the object and bounces off the top and reflects to the bottom, then focuses at the opening to give an illusion of the object. Be careful that students do not move the object in the bottom, you do not want to scratch the surfaces

   periscope - REFLECTION There is 2 mirrors inside at an angle that allow you to see things in a right angle.

   prism – REFRACTION Light is bent twice when it passes through a prism and the separation of color is quite noticeable - a rainbow. The prism separates the frequencies of light, so a rainbow appears. If your classroom has bright sunlight that is a good source of light; otherwise use a flashlight. Light must be shone correctly through a prism in order to get a rainbow.

   small telescope - REFRACTION if you expand the telescope the refracted light will come in focus

   teleidoscope – REFRACTION The lens refracts light at different angles

   mirror – REFLECTION Students should just look at themselves.

   biconvex lens – REFRACTION Hold the biconvex lens to the light and focus an image on the other side. Notice it will focus it upside down

   Minimizer – REFRACTION The way the minimizer is made is to refract light to make things seem smaller

PROBLEM: How can you tell the difference between reflection and refraction?

PREDICTION:

PROCEDURE:

	Reflection or refraction	Describe or draw
1. 3-D mirascope		
2. periscope		
3. prism		
4. small telescope		
5. teleidoscope		
6. mirror		
7. biconvex lens		
8. Minimier		