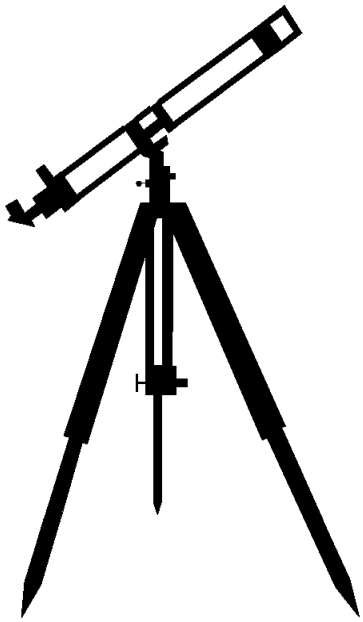
Universe Cycle

The Search for Our Beginnings

THIRD GRADE

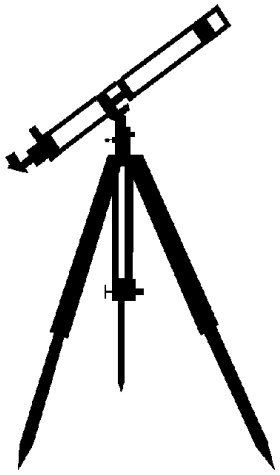
EARTH



1 WEEK
LESSON PLANS AND
ACTIVITIES

UNIVERSE CYCLE

OVERVIEW OF THIRD GRADE



UNIVERSE

WEEK 1.
PRE: *Contrasting different components of the Universe.*
LAB: *Comparing and contrasting stars.*
POST: *Comparing relative and absolute brightness.*

SOLAR SYSTEM

WEEK 2.
PRE: *Distinguishing between revolution and rotation.*
LAB: *Discovering the terrestrial planets.*
POST: *Investigating the gas giants.*

EARTH

WEEK 3.
PRE: *Comparing lunar and solar eclipses.*
LAB: *Discovering how landforms are created on Earth.*
POST: *Exploring the reasons for seasons.*

GEOGRAPHY

WEEK 4.
PRE: *Describing different types of maps.*
LAB: *Exploring how to make a map.*
POST: *Comparing maps and globes.*

UNIVERSE CYCLE - EARTH (3)

PRE LAB

Students learn about lunar and solar eclipses.

OBJECTIVES:

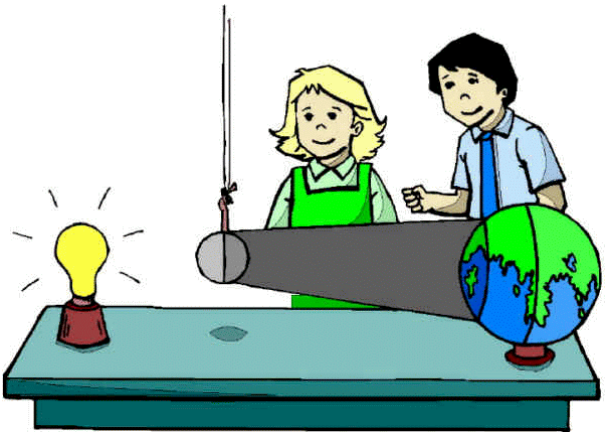
1. Exploring eclipses.
2. Comparing lunar and solar eclipses.

VOCABULARY:

lunar eclipse
solar eclipse

MATERIALS:

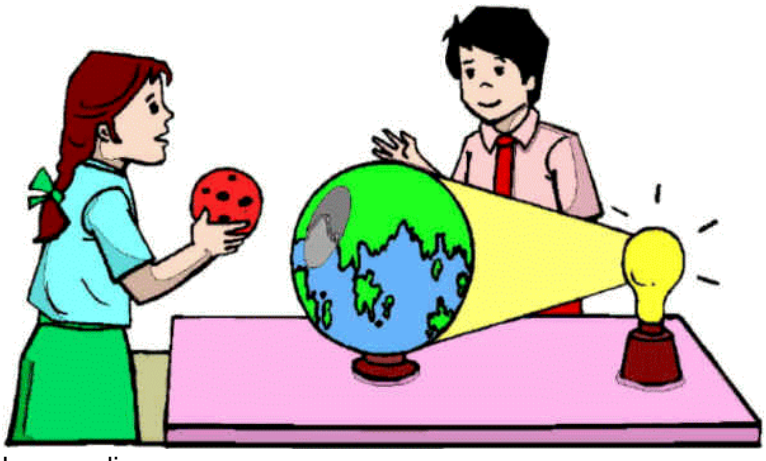
Planetarium Model
Eclipse: Darkness in Daytime by F. Branley


Solar eclipse

BACKGROUND:

A solar eclipse takes place when the Moon comes between the Sun and Earth. The Moon thus casts a shadow on the "daytime" part of the Earth. Because the Moon is small compared to the Earth, only a limited portion of the Earth experiences the eclipse. Viewed from Earth, the Moon appears to move in front of the Sun for a period of minutes to hours. It becomes as dark as night if the Sun is fully blocked, or partially dark if the eclipse is incomplete.

When the Earth is between the Sun and the Moon, a lunar eclipse can occur. The Earth blocks off the sunlight from the Moon. This may cast the Moon into total darkness, or if the eclipse is partial, the Moon may glow a dark red color.

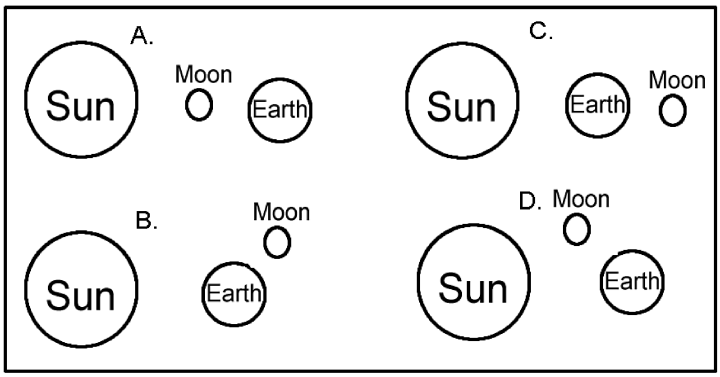

Lunar eclipse

When the Moon is not aligned with the Sun and Earth, only part of it is visible. The Moon revolves counterclockwise around the Earth. From the time of a new Moon, when no portion of it is visible, the Moon increases in size. The right side of the Moon becomes visible first. The Moon grows to its full size, and then shrinks. Shadows also progress across the Moon from right to left.

PROCEDURE:

1. The book, *Eclipse: Darkness in Daytime* describes how scientists predict when an eclipse will take place and where the Moon's shadow will fall. Read *Eclipse: Darkness in Daytime* to the class. Make sure the students understand what an eclipse is. Explain how the appearance of the Moon changes as it rotates around the Earth. It may help to draw diagrams on the board.

2. Set up the planetarium as shown in the diagrams below. Ask the students the questions that follow, and have them answer them out loud. The answers are given below in parentheses.



General questions: (1) Ask the students how many planets are shown on the model. (2) Have the students name them. (Venus, Earth) (3) Which inner planets are missing? (Mercury and Mars). (4) Which planet on this model receives the most heat from the Sun? (5) (Venus is the closest on this model.)
Diagram A: Are there any areas of the Earth and Moon that are not receiving sunlight? What is it called when this happens? (Yes, part of the Earth is in shadow. This is called a solar eclipse).
Diagram B: Are there any areas of the Earth and Moon that are not receiving any sunlight? What is it called when this happens? (Yes, this time part of the Moon is in shadow. This is called a lunar eclipse).
Diagram C: How much of the Moon is visible from Earth? (Half) Make sure the students see that the right half of the Moon is visible.
Diagram D: How much of the Moon is visible from Earth? Is it the same part of the Moon as in the last question? (Half of the Moon is visible again. No, the left half of the Moon can be seen this time.)

3. For more information on past and future eclipses, visit : http://sunearth.gsfc.nasa.gov/eclipse/OH/OH2002.html.
This is a NASA website with links to solar and lunar eclipse information, including maps, up to 3 years into the future.

UNIVERSE CYCLE - EARTH (3)

LAB

Students compare and contrast the erosional effects of liquid water and ice.

OBJECTIVE:

1. Comparing water and ice erosion.
2. Discovering how landforms are created on Earth.

VOCABULARY:

erosion
ice
landscape
water
wind

Ice flowing downhill carves valleys into a mountain range.

MATERIALS:

2 aluminum trays
2 small clay slabs
250 ml sand
1 cup, water and ice
beakers
landscape models (optional)

A close up of ice flowing downhill. The dirty color is from sediment in the ice.

BACKGROUND:

One way in which the Earth differs from all other planets is the presence of abundant water on and within its surface. Water in the three forms of matter (liquid, gas, and solid) make this planet alive, both geologically and biologically.

Liquid water can cause massive changes to the Earth's surface through weathering and erosion of rock. It transports loose material, wearing down mountains and filling in lakes and valleys. Liquid water also helps plants grow, which may in term enhance erosion and reshaping of the Earth's surface.

Ice, in the form of glaciers and ice caps, is also a powerful force of erosion and transportation. Ice is restricted to colder areas (high altitudes and

high latitudes), but it can cut through just about anything. A glacier can carve its way through a mountain.

Wind is not as strong as water, but over a long period of time it can also erode. In combination with water, wind can be more destructive.

This lab compares the two different ways that water erosion works, as a solid (ice) and as a liquid. There are two parts in this activity.

A U-shaped ice cut valley. The ice is flowing into the ocean.

First, the students compare a landscape created by snow and ice with one formed by running water. This part of the activity uses portions of topographic maps. Topographic maps record precise information about elevations on the Earth's surface. This appears on the map in the form of brown contour lines. These are imaginary lines of equal elevation. Your students are unlikely to be able to grasp the full concept of contour maps at this point. However, you should explain to them that when contour lines are close together, the landscape is steep (this is typical for glacial landscapes), and when contour lines are far apart, the landscape is flatter. This is more common in landscapes carved by liquid water.

A V-shaped stream valley in Colorado, USA.

In the second part of this lab students will explore how ice acts as a cutting agent. They will see that ice can cut clay but water cannot. Although this may seem obvious to you, it is often not to students. Landforms created by glaciers tend to be U shaped, while landforms created by rivers tend to be V shaped. The river concentrates its energy just where the river is cutting, whereas a glacier cuts all areas that it covers.

PROCEDURE:

1. Show the class pictures of the landforms created by ice or running water. The web sites recommended below contain many good examples. Alternatively, if they are available, show the class models of different landscapes. These three dimensional tools are very effective in explaining landscapes to children.

a) http://geogweb.berkeley.edu/GeoImages.html - The Geo-Images Project at UC Berkeley. Contains abundant land and aerial photographs of regions around the world.

b) Gemorphology from Space, a NASA publication featuring satellite and astronaut photographs. Clearly arranged by process, with good global coverage. The link is: http://daac.gsfc.nasa.gov/DAAC_DOCS/geomorphology/GEO_HOME_PAGE.html

2. First, have them examine the maps. They should be able to distinguish the glacial landscape by the presence of white areas of ice and snow. This landscape should look steeper; there are many places where the contour lines are very close together. The other map shows a landscape carved by liquid water, shown by blue lakes and streams. The landscape here should seem flatter to the students.

Water flowing downhill in this stream transports much material

3. Have the students set up the lab materials for Exercise 2. They should work in pairs again. Make sure each student gets a chance to experiment with the water and ice. Have them record their observations.

4. Go over the student's observations as a group. You can also complete the conclusion as a group. The main point is for the students to realize that ice is an important erosional force in cold climates.

Niagara Falls. An example of erosion by water

5. You may want to describe frost wedging to the students. In areas where it gets cold and then warms up during summer you can "mechanically" weather rocks or roads. Water gets into cracks in the road or rock. It freezes in the winter which expands the crack (remember that water expands when it freezes). When the warm weather comes and the ice melts, the crack is larger. As this process repeats, the road or rock is gradually broken into pieces. Remind students that when a can of soda freezes it can burst the can!

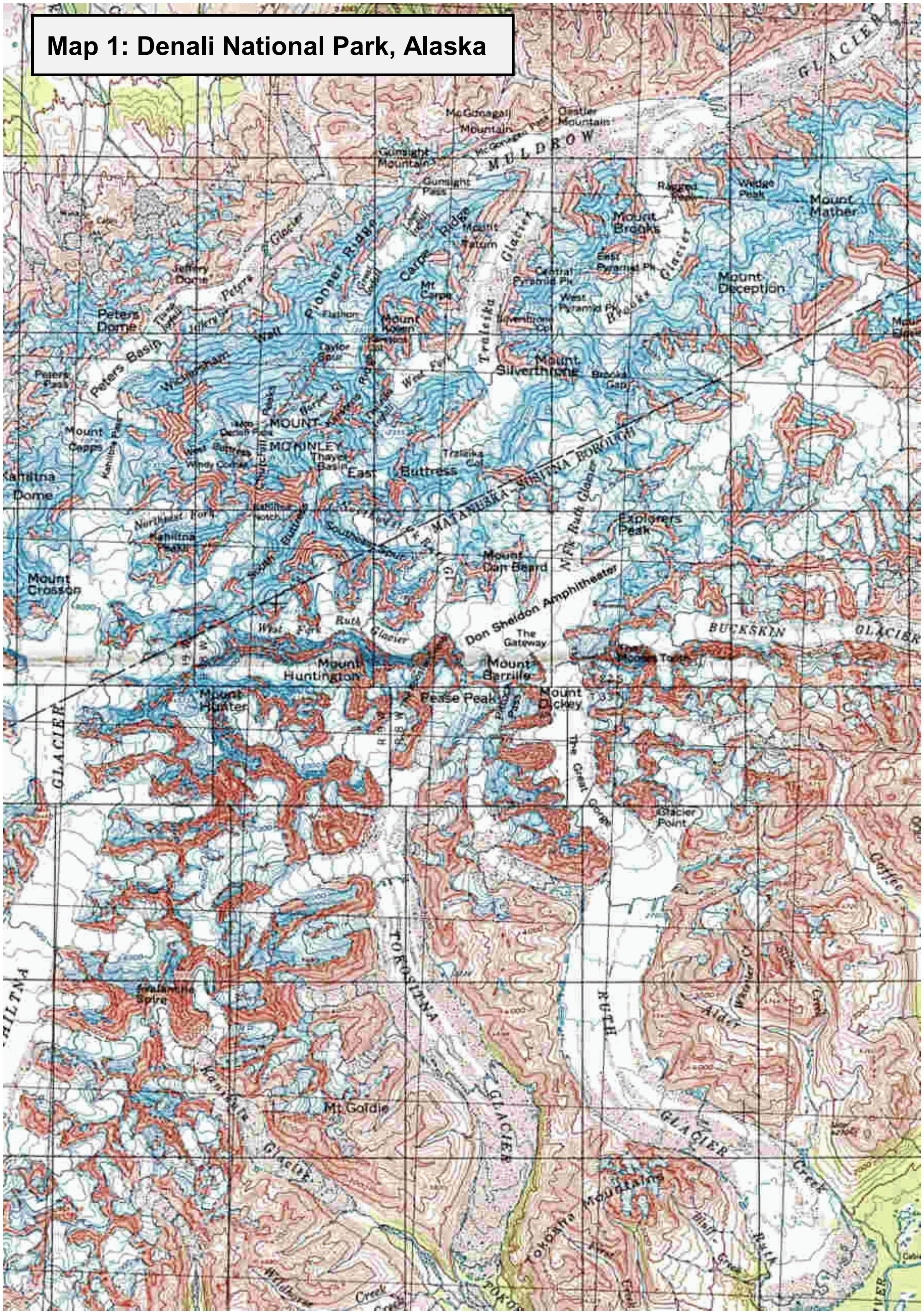
UNVERSE CYCLE - EARTH (3) LAB

PROBLEM: How does nature change the Earth's surface over time in areas where it is extremely cold?
PREDICTION: _____
PROCEDURE:
EXERCISE 1. Look at the maps on the next two pages. Compare their landscapes.
1. Write the name of the location of each map.

2. Which map has more snow and ice? _____ How can you tell?
_____
3. Which map has more lakes and ponds?_____
How can you tell? _____
4. Which area has been more effected by ice and snow? Explain your answer.
_____
EXERCISE 2.
MATERIALS: 2 trays, sand, 2 small clay slabs, beaker, water and ice cubes
1. Place one slab of clay into a tray. Try to "carve" a landscape in one of the slabs of clay by pouring about 100 ml of water on it.
Is there any way that you can make the water "cut" the clay? Explain your answer.
_____
2. Remove the clay from the tray. Take 250 ml of sand and pour it into the tray, making a hill. Pour 100 ml of water on the top of the sand hill. Record what happens.
_____
_____
3. Now put the second slab of clay into a tray. Using a piece of ice, try to "carve" a landscape in it. Does the ice cut the clay? Can you actually make a landscape?
_____
4. Draw your top and side views of your ice-carved landscape on the next page.

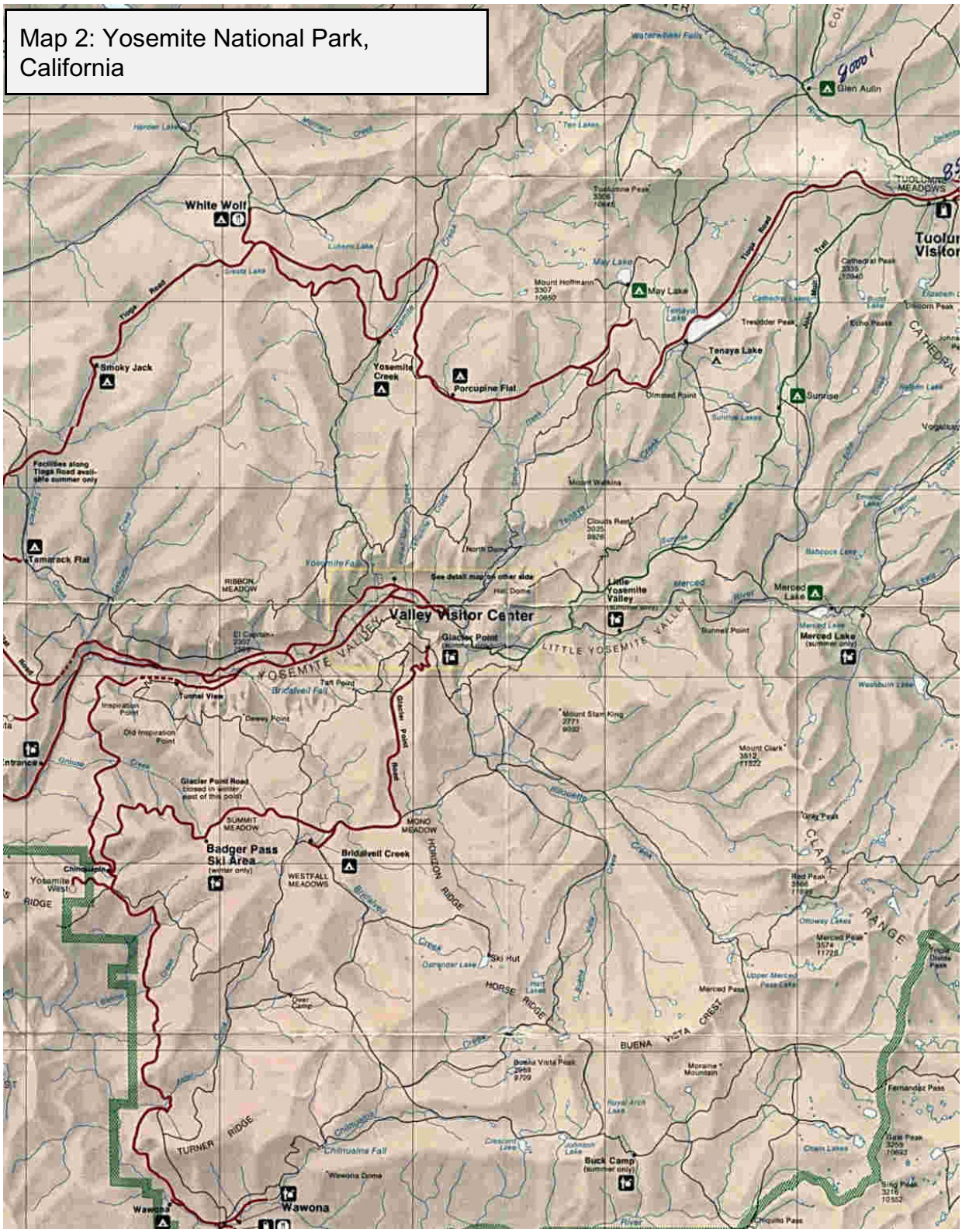
TOP VIEW	SIDE VIEW

CONCLUSION: Is water or ice the main agent of erosion in areas where it is extremely cold? What do you think is the major agent of erosion in warm areas?
_____



Map 1: Denali National Park, Alaska

Map 2: Yosemite National Park, California



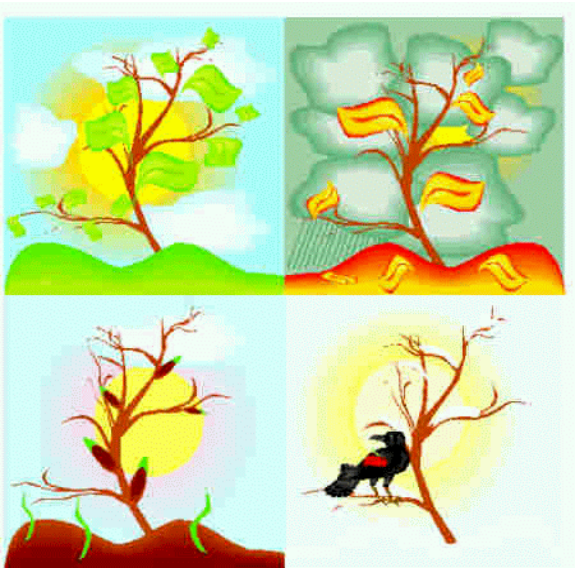
UNIVERSE CYCLE - EARTH (3)

POST LAB

Students read aloud to determine why the Earth has seasons.

OBJECTIVES:

1. Exploring the reason for seasons.
2. Discovering seasons.



VOCABULARY:

fall
season
spring
summer
winter

MATERIALS:

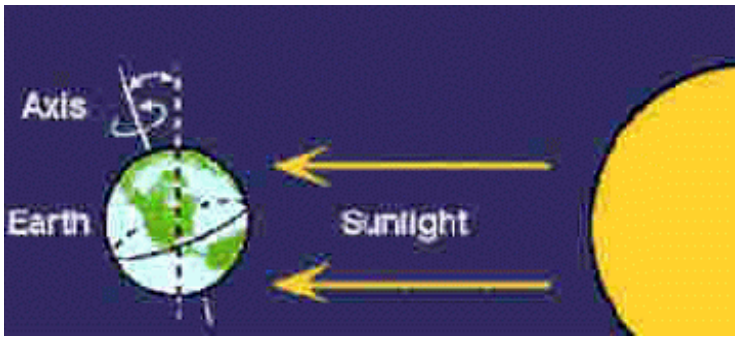
Sunshine Makes the Seasons F. Branley

BACKGROUND:

In the Solar System, the Earth is a unique planet. Its surface has abundant liquid water, and supports a great diversity of life. Another factor that makes the Earth special is that its seasons allow for cold to hot climates which make living here just right for humans.

Seasons are caused by the tilt of the Earth's axis which allows the Sun's rays to warm to cool the planet depending on the angle of the Sun's rays.

Many people logically conclude that since we are warm in summer we are closer to the Sun., but this is false. The seasons are caused by the positioning of the Earth as it revolves around the Sun, and by the tilt of the Earth's axis. The Earth's axis is tilted 23.5° from the vertical. This means that solar energy strikes the Earth's surface unevenly.



It is summer in the Northern Hemisphere when the North Pole tilts toward the Sun. This puts the Sun more overhead, so solar energy strikes the Earth most directly. Simultaneously, the Southern Hemisphere is experiencing winter, because the Sun's rays are least directly overhead. In half of a revolution (6 months), the North Pole

tilts away from the Sun, making solar energy least direct, so it is winter in the Northern Hemisphere, and summer in the Southern Hemisphere. Fall and spring occur in between these two extremes when the axis is tilted neither toward or away from the Sun.

PROCEDURE:

1. Have the students read *Sunshine Makes the Seasons* out loud.

2. Ask the students if they think the book is informative about the seasons. Ask them to comment on the pictures and the writing style. Ask them each to find one good point and one bad point as they critique the book.

3. Ask the students what season is occurring in Australia if the United States is having summer conditions (the answer is winter, because the sunlight hits Australia least directly). If the students have read and understood both books, they should be able to determine the answer.