

# Workshop 8:

# Wind and Weather

## DESCRIPTION

Climactic conditions in each season are not just the result of the tilt of the Earth's axis. In this workshop we will examine the effect of light on our weather. We will follow the path of light as it enters our atmosphere, and is absorbed, reflected, and radiated as heat by the land and by the water. We will visit a fifth grade classroom as they explore these phenomena. And we will examine a weather map to discover the significance of high and low pressure.

## LEARNING OBJECTIVES

Participants will be able to:

- Draw diagrams and generate examples that explain how sunlight provides the energy that drives weather on Earth.
- Draw diagrams and verbally explain the high and low pressures as one of the two major components driving wind on Earth.
- Draw diagrams and verbally explain how the Coriolis Effect deflects wind into the swirling patterns seen in satellite images.

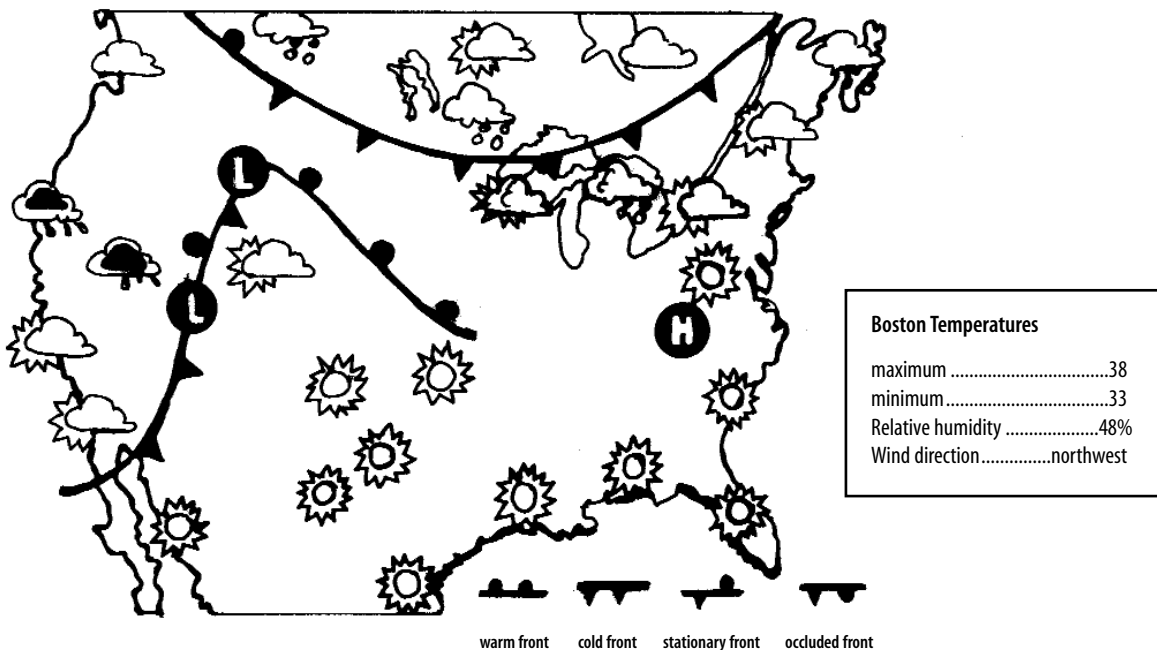
# Workshop 8 timeline

## GETTING READY

30 minutes

### The Weather Map

1. Look at the weather map below. There are a variety of words, symbols, and data recorded. In your group, make a two-column chart and list the terms with which you are familiar and describe your understanding of each



### The Parked Car

2. You have all probably had the experience of getting into a car that has been parked in the Sun with all its windows closed, and gasping as you felt the heat inside. Where does this heat come from? To begin to answer this question you need to know that the glass of your car windows lets only visible light photons through, not infrared photons.
  - Describe what might be happening to the visible light photons inside your car.
  - Explain why the car gets hotter and hotter if no infrared photons can enter or leave the car.

# Workshop 8 timeline

GOING FURTHER

30 minutes

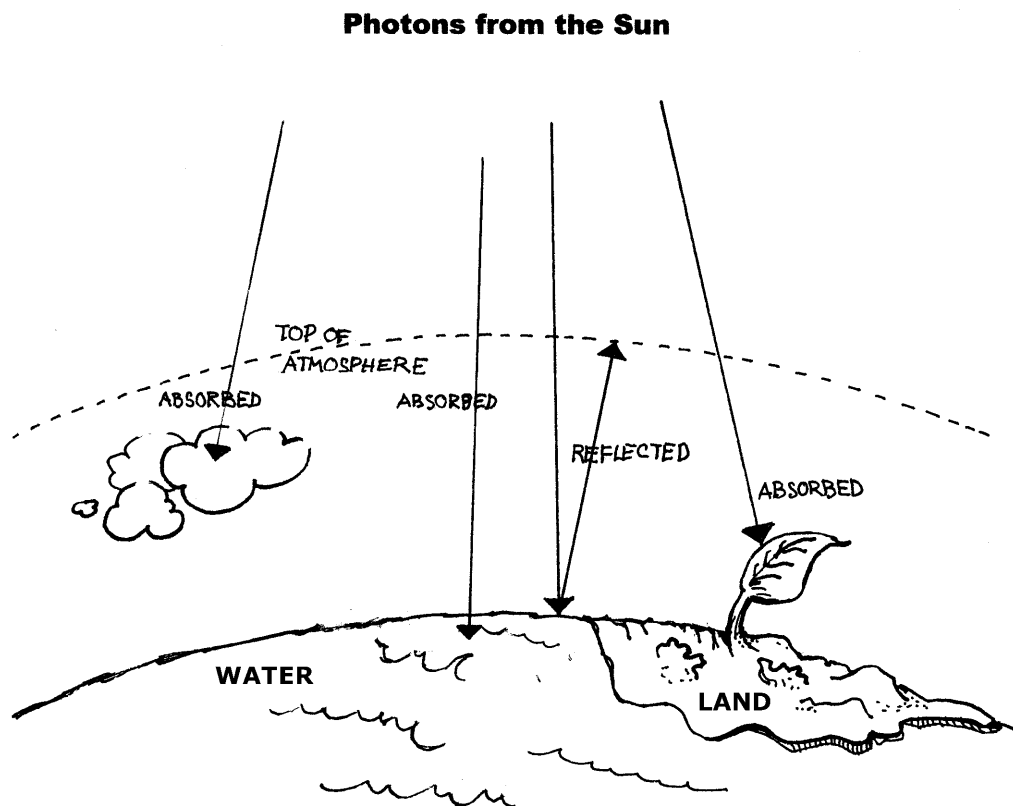
## Revisiting the Weather Map

1. Revisit your two-column charts from the Getting Ready activity. What changes or extensions would you make to your chart?

## The Sun's Energy and the Earth

2. What happens to the Sun's energy as it interacts with the Earth and its atmosphere?

The drawing below shows a simplified depiction of what happens to the Sun's energy as it reaches the Earth.



---

## GOING FURTHER CONT'D

Of the 100% of the photons coming from the Sun, approximately

- 19% is absorbed by clouds
- 51% is absorbed by the Earth's surface
- 30% is reflected back from the clouds, the atmosphere and Earth's surface combined

Use your learning from these workshops to answer the following questions:

1. Of the 51% of the Sun's energy reaching the surface, what regions of the electromagnetic spectrum will they be from? Give a reason for your answer.
2. Explain what is happening when we say that photons of light energy are absorbed by the Earth's surface. What effect on the Earth would this absorption have?
3. Explain what is happening to the photons when they are absorbed by green plants and phytoplankton.

# For next time

---

## HOMework ASSIGNMENT

### Light in Your Classroom

Think of the concepts that have been discussed in this workshop series. Choose a unit that you teach in your particular grade level which is related to a topic that we covered. In what ways will your learning help you to approach this unit differently?

- What concepts are appropriate to include for your students?
- What experiences would your students have in order to learn these concepts?
- What questions might you ask to find out how students' learning is progressing?

This might include changing the language you use, reordering the introduction of concepts, or presenting new activities.

# Standards

---

## National Science Education Standards

### K-4 Standards: <http://bob.nap.edu/html/nses/html/6c.html#es>

The sun provides the light and heat necessary to maintain the temperature of the earth.

*Content Standards: K-4: Earth and Space Science: Objects in the Sky*

The surface of the earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

Weather changes from day to day and over the seasons.

*Content Standards: K-4: Earth and Space Science: Changes in the Earth and Sky*

Weather changes from day to day and over the seasons.

*Content Standards: K-4: Earth and Space Science: Changes in the Earth and Sky*

### 5-8 Standards: <http://bob.nap.edu/html/nses/html/6d.html#es>

The solid earth is layered with a lithosphere; hot, convecting mantle; and dense, metallic core.

Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.

Water is a solvent. As it passes through the water cycle it dissolves minerals and gases and carries them to the oceans.

Clouds, formed by the condensation of water vapor, affect weather and climate.

*Content Standards: 5-8: Earth and Space Science: Structure of the Earth System*

Fossils provide important evidence of how life and environmental conditions have changed.

*Content Standards: 5-8: Earth and Space Science: Earth's History*

The sun is the major source of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. Seasons result from variations in the amount of the sun's energy hitting the surface, due to the tilt of the earth's rotation on its axis and the length of the day.

*Content Standards: 5-8: Earth and Space Science: Earth in the Solar System*

# Standards

---

## American Association for the Advancement of Science (AAAS) Project 2061 Benchmarks

<http://project2061.aas.org/tools/benchol/bolframe.html>

By the end of the 2nd grade, students should know that:

Some events in nature have a repeating pattern. The weather changes some from day to day, but things such as temperature and rain (or snow) tend to be high, low, or medium in the same months every year.

*The Physical Setting: 4B The Earth: K-2*

By the end of the 2nd grade, students should know that:

Water can be a liquid or a solid and can go back and forth from one form to the other. If water is turned into ice and then the ice is allowed to melt, the amount of water is the same as it was before freezing.

*The Physical Setting: 4B The Earth: K-2*

By the end of the 5th grade, students should know that:

The earth is one of several planets that orbit the sun, and the moon orbits around the earth. Stars are like the sun, some being smaller and some larger, but so far away that they look like points of light.

*The Physical Setting: 4B The Earth: 3-5*

By the end of the 8th grade, students should know that:

Energy cannot be created or destroyed, but only changed from one form into another. Most of what goes on in the universe—from exploding stars and biological growth to the operation of machines and the motion of people—involves some form of energy being transformed into another.

*The Physical Setting: 4E Energy Transformations: 6-8*

---

## Related Sources

Dennis, Jerry, (1992). *It's Raining Frogs and Fishes: Four Seasons of Natural Phenomena and Oddities of the Sky*. New York, NY : HarperCollins

Hiscock, Bruce, (1993). *The Big Storm*. New York : Maxwell Macmillan International

Kingsbury, Stewart A., Kingsbury, Mildred E., Mieder, Wolfgang, (1996). *Weather Wisdom : Proverbs, Superstitions, and Signs*. New York : Peter Lang

Llewellyn, Claire, (1997). *Wild, Wet and Windy : The Weather--From Tornadoes to Lightning*. Cambridge, Mass. : Candlewick Press

Lutgens, Frederick K., Tarbuck, Edward J., (1995). *The Atmosphere: An Introduction to Meteorology*. Englewood Cliffs, N.J. : Prentice Hall

Lynott, Bob, (1994). *How Weather Works, and Why*. Portland, OR : Gadfly Press

McIlveen, J. F. Robin, (1991). *Fundamentals of Weather and Climate*. London : Chapman & Hall

McMillan, Bruce, (1991). *The Weather Sky*. New York : Farrar, Straus, Giroux

Murphree, Tom, (1998). *Watching Weather*. New York : Henry Holt & Company

Perry, Phyllis Jean, (1996). *Rainy, Windy, Snowy, Sunny Days: Linking Fiction to Nonfiction*. Englewood, Colo. : Teacher Ideas Press

Wagner, Ronald L., (1994). *The Weather Sourcebook : Your One-stop Resource for Everything You Need to Feed Your Weather Habit*. Old Saybrook, Conn. : Globe Pequot Press

Watson, Benjamin A., (1993). *Acts of God: The Old Farmer's Almanac*. New York : Random House

Useful web sites:

<http://aerohost.com/weather-satellite.htm>

[http://www.photolib.noaa.gov/lb\\_images/historic/nws/monster.htm](http://www.photolib.noaa.gov/lb_images/historic/nws/monster.htm)

[http://www.esdim.noaa.gov/weather\\_page.html](http://www.esdim.noaa.gov/weather_page.html)

<http://www.nws.noaa.gov>

<http://www.learner.org/exhibits/weather>