



## Pre-Classroom Activities

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### K-4 Activity #1

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#### Article: High-Tech Firefighting

Call Smokey The Bear or log on the Internet? Firefighters are logging on the Internet. They use NASA **technology** to help fight fires.

Altus II is a special plane. It takes pictures of fires. It sends the pictures to the Internet. The firefighters can see the big picture using the Internet.

The first Altus was a plane that did not need a pilot. It flew slowly for many hours very high in the sky. The Altus helped people learn about the Earth's climate.

The Altus II takes pictures of the ground using a television camera and a **scanner**. They can find the flames through the smoke.

The pictures are sent to a satellite. They are then sent to NASA scientists. They make a special drawing that can be placed over a map. It shows the location of the fire. It shows all the equipment around the fire, too. They put the pictures on the Internet. This new technology only takes 15 minutes.

Before the Altus, the planes had to fly very low. They could only take pictures of smaller areas. Then, the plane had to land to unload the pictures. The new Altus II does not have to land to send its pictures to the Internet. That makes it faster.

# I Am A Sensor

## Teacher Sheet(s)

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**Objective:** To pretend to be a remote sensor, and to identify objects of a certain color.

**Level:** K-4

**Subjects(s):** Physics

**Prep Time:** 10-30 minutes

**Duration:** One to two class periods

**Materials Category:** Special Requirements

### Materials:

- Red, blue, and green pipe cleaners (two per color for each student)
- 10-15 sheets of green, blue, and red acetate or colored cellophane paper
- One set of glasses per student (see pattern at end of Teacher Sheets)
- Construction paper
- Scissors
- Tape

### Related Links:

#### NASA's Observatorium Remote Sensing

[http://physics.ship.edu/~mrc/astro/NASA\\_Space\\_Science/observe.arc.nasa.gov/nasa](http://physics.ship.edu/~mrc/astro/NASA_Space_Science/observe.arc.nasa.gov/nasa)

### Pre-Lesson Instructions:

- Divide the class into three equal groups. One group for the red, one for the blue, and one for the green glasses.
- Prior to starting this activity, spread out the pipe cleaners on a grassy area outside. They should **not** be hidden.

### Background Information:

Recall that remote sensing is simply obtaining information about an object without coming into direct physical contact with it. This process has been around a long time.

The Earth's surfaces reflect incoming energy from the Sun. When you see a blanket of snow or the surface of a lake on a sunny day, it is so bright that it almost hurts your eyes to look at them. These objects are clearly reflecting the Sun's energy. On the other hand, the surface of a road that's been tarred or the black top of a roof is not too bright. They absorb more of

the sun's energy than they reflect.

Most of the remote-sensing satellites carry scanners that record the amount of reflected light energy from the Earth's surfaces. Specifically, these scanners record this reflected energy within specific parts of the electromagnetic spectrum (EMS). They record energy from any surface: natural objects like water, or man-made things like buildings.

The human eye is an excellent reference point for understanding remote sensing. Humans detect only three bands of radiation from the electromagnetic spectrum. It is the part that makes up the visible portion of the EMS. These three bands represent the primary colors: red, green, and blue. The full palette of colors we see is created when the three bands are mixed together in different combinations.

In contrast, remote-sensing instruments can be designed to detect and measure any number of bands from the light and energy spectrum. We see different things (and see things differently) in the various bands depending on the amount and type of the reflected energy from the object. Remote-sensing satellites will record the amount of energy reflected from an object through multiple bands of the EMS.

The Earth looks different through each of the bands of the EMS, and we can use different bands to see specific things on the ground. Looking at them through different bands can bring out features that we are often unable to see with the naked eye. For example, pine tree species may appear to be very similar in color when we look at them. However, when we use an infrared band from a remote satellite or aircraft sensor, we can pick out the different pine species much easier.

### **Guidelines:**

1. Read orally with or to the class the K-4 article, "High-Tech Fire Fighting."
2. Introduce the class to the term "remote sensing" by defining the words separately. (For example: the word "sensing" is similar to the word sense—as in our sense of sight, sound, and touch. The word "remote" reminds us of the TV remote control—the television is operated from a distance, as is a remote-controlled car.)
3. Explain that scientists are using remote sensing to gather information about Earth, space, weather, oceans, and plants.
4. Ask the class the following question and explain.
  - o Have you ever looked at what happens to sunlight when it passes through a prism? The light separates into the colors of the rainbow, right? Well, this visible light is just a small part of what scientists call the "electromagnetic spectrum." The electromagnetic spectrum includes the entire range of waves; waves can teach us about the amount of energy an object is producing. A picture of the Sun in radio waves would look very different from a picture in x-rays, and both would look very different from what the Sun looks like in the visible wavelengths—wavelengths our eyes can see.

5. Explain to the class that the group activity they are going to do will be dealing with the visible portion of the spectrum. It is a very small group of wavelengths that make up the visible light.
6. Explain the directions below to the class, and help them make remote-sensing glasses.
  - Trace the eyeglass pattern on construction paper, and cut it out.
  - Hand out a different color of the acetate or cellophane paper to each group of students
  - Cut the colored acetate or cellophane paper just large enough to cover the lens area, and tape it on to the glasses.
  - Measure and cut the sides of the glasses to fit your head, and then tape them to the front of the glass frames.
7. Tell the class that they are going to pretend to be part of a remote-sensing scanner.
8. They will be searching for things they can see through their colored glasses.
9. They must only look through their colored glasses to find things.
10. When they see a pipe cleaner, they may pick it up.
11. There will be a time limit.
12. Listen for the teacher to say, "Sensors on."
13. You must stop as soon as you hear, "Sensors off."
14. Take the class outside to the grassy area where the pipe cleaners have been distributed. Be sure to have the students place the glasses on before you reach the area where the pipe cleaners are located.
15. Say, "Sensors on," allow about 10 minutes, and then say, "Sensors off."
16. Tell students to take off their glasses and look at what everyone picked up. Have groups compare materials with each other.
17. After the students have collected the pipe cleaners, discuss why they were only able to see certain colors through their glasses. *Explanation: Each color has a different wavelength. The lenses in the glasses act like filters. The filters are transparent for one or more colors of light. The colors pass through the filters, but the other colors are absorbed. The color of the filter is the color of light that passes through it. Your glasses absorb certain colors of light and allow other colors to pass through. Everything you observe through your glasses is seen in the colors of the light that passes through them.*
18. If time allows, have the groups exchange glasses with each other, and repeat the activity

### **Discussion/Wrap-up:**

- Have students describe what remote sensing is and give examples of how it is used.

Note: No Student Sheets Necessary



## K-4 Activity #2

### Article: Your View From Above



Thanks to NASA, you can see things that astronauts see. But, you don't have to leave Earth.

There are lots of great things about going into space. One is looking down at Earth. Once they get back, astronauts love to

show the pictures they took of Earth. They show us a view we have never seen. Mountains look like ant hills. Buildings fade away. Earth takes on a whole new look. Would you like to take a picture like this? What picture would you take from space?

You can do this! Classes can sign up for this free program. It is called EarthKAM. A camera sits on the Space Station. It is pointed toward Earth. Kids get to pick what they want to photograph. The pictures are put on the **Internet**. Classes can use them to learn about **geography**. They can study Earth's **resources**, too. You have to be a kid to take the pictures. But, you don't have to be one to use them. Anyone can look at them **online**.

Sally Ride came up with this idea. She was NASA's first woman in space. The first camera flew on the Shuttle. Then, EarthKAM took over. It stays on the Station.

EarthKAM is in its eighth year. It is important to learn about geography and **ecology**. And, NASA gives kids a whole new way to do it.

### EarthKAM Land Forms

## Teacher Sheet(s)

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**Objective:** To use EarthKAM images to learn about land forms.

**Level:** K-4

**Subjects(s):** Geography, Technology

**Prep Time:** Less than 10 minutes

**Duration:** One class period

**Materials Category:** Special Requirements

### Materials:

- Internet access

### Related Links:

[International Space Station EarthKAM Land Formations Activity](#)

### Supporting Article(s):

### Your View From Above

### Pre-Lesson Instructions:

- Remind students of the school's policy on use of the Internet.
- Arrange to use the school's computer lab for at least 30 minutes.
- Decide if the activity will be performed in groups. For younger students, this lesson would best be completed in a group setting. Use of a large screen monitor would ensure that all students can see the images clearly.

### Background Information:

ISS EarthKAM (Earth Knowledge Acquired by Middle school students) is a NASA education program which enables students, teachers, and the public to learn about Earth from the unique perspective of space. At the core of the program is a spectacular collection of digital images of Earth. The image collection and accompanying learning guides and activities are extraordinary resources to support classes in Earth science, space science, geography, social studies, mathematics, communications, and

even art.

ISS EarthKAM images are unique because they are taken by middle school students. Using the World Wide Web, select middle schools request images based upon their classroom investigations. Since the program's inception in 1996, the EarthKAM camera has flown on five Space Shuttle flights and taken almost 5,000 images. Currently, the camera resides on the International Space Station and has taken a variety of pictures.

In this lesson, students will investigate the Land Activity on the EarthKAM Web site.

**Guidelines:**

1. Read the K-4 article, "Your View From Above," orally.
2. Discuss the job of EarthKAM and how it does its job.
3. Use the International Space Station EarthKAM link listed in the Related Links section.
4. Complete the activity by guiding students through each land form.

**Discussion/Wrap-up:**

- Discuss each land feature as it is viewed.



## K-4 Activity #3

### THE ADVENTURES OF ECHO THE BAT

Ordering information for the book is located below under **CORE CATALOG** below.

#### Materials

- Echo the Bat book
- OR
- Computer with Internet access

#### Background

As Echo begins his journey in search of the Bat Cave, he doesn't know that there is a satellite flying high in the sky above him. The big pictures in the second half of the story show you what the satellite sees. Lift the pop-up pictures to see what Echo is seeing as he is flying. As you read the story, ask the child what shapes they see. Can they recognize a pattern? Can they describe a color or a texture? After reading the story, go back through the pages with the satellite pictures and ask some of the following: Perspective, shape, texture, pattern, and color.

Activities and activity sheets are provided on the web site listed below.

#### Procedure

You may not receive the book in time to complete this activity with the book in your classroom before the NASA event but the website will provide useful information for before and after the event.

The Adventures of Echo the Bat Website – Computer needed (Grades K-4)

To engage children beyond the book, check out the lesson plans (website below) that reinforce four basic themes or concepts fundamental to the interpretation of satellite imagery (perspective, shape & pattern, color, and texture).

<http://science.hq.nasa.gov/kids/imagers/k-4/lessonsforbook.html>

#### **CORE CATALOG**

<http://catalog.core.nasa.gov/core.nsf/item/300.1-06p>

This link gives you details about the book. You can click on HOW TO ORDER at the top to order the book.