

## Investigation One: How Can We Explore Antarctica?

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### Getting Your Bearings

Imagine wanting to map Antarctica or to study how it changes over time. It is the coldest, windiest, driest, and highest continent on Earth, so it is a difficult place for people to explore. During the Antarctic winter, in places near the South Pole the Sun is below the horizon for months at a time and it is dark 24 hours a day. Even when the Sun is above the horizon, Antarctica is usually covered by clouds.



Image Courtesy of Antarctic Cooperative Research Centre and Australian Antarctic Division

In the early 20th century, Antarctica was largely uncharted. For Shackleton to explore Antarctica, he had to go there himself, prepared for extreme conditions. He had to be self-reliant; he couldn't even use a radio for communication. He had just a few maps, navigation instruments that relied on the Sun for readings, accounts from ship captains who hunted seals and whales in the area, and a handful of intrepid explorers.

Satellite technology has changed the way people explore Antarctica. You are about to look at some images of Antarctica, including several images that were created from information collected by satellites orbiting Earth. These satellites carry different kinds of sensors. A camera is one kind of sensor. Cameras capture visible light and create photographic images. Other kinds of sensors detect other forms of energy and create different kinds of images. For example, some satellites carry instruments that can sense microwaves, a kind of radiation that is constantly being emitted from the surface of Earth. Other satellites carry radar, an instrument that bounces a radio signal off remote objects then maps the signal that comes back. Different sensors give us different views and different information about the objects they investigate.

Some satellite images record Earth's colors as we see them. These are called *true-color images*. In other images, certain features are assigned bold or contrasting colors to make them show up better. For example, high mountains might be colored red. Such images are called *false-color images*.

The following readings will be given to you by your teacher.

[The Voyage of the \*Endurance\*](#) by Maurice Isserman

[History of Mapmaking](#)

You can see [The Antarctic Explorer time-line](#) online to learn more about Antarctica's history.

### Goals

1. You will describe how six images of Antarctica were created. You will figure out what each image can tell you—and what it can't.
2. You will discuss how modern technology might have changed the course of Shackleton's expedition.

## Exploring and Discovering

### Six Images

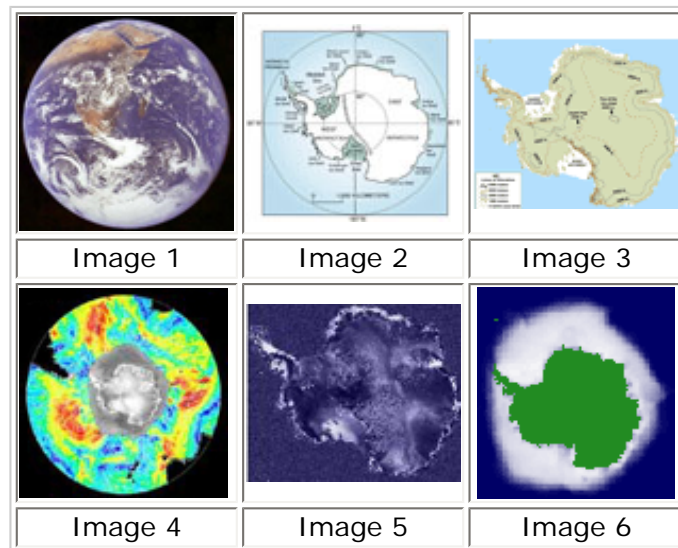
In this activity, you will investigate six images of Antarctica. Each image was created in a different way, and each gives scientists different kinds of information. Used together, these six images can tell you a lot about Antarctica.

Your teacher may give you a handout showing all six images, or you can use the online Image Gallery. Click on an image to read about it.

### Materials

- Images 1–6

#### Image Gallery



### Procedure and Record Sheet

1. Investigate *Image 1: Earth From Space* as a class. Discuss the following questions and record your answers on your Six Images record.

*How was this image made? Was satellite technology involved?*

*What can I see in this image or learn from it? (Be as detailed as possible.)*

*Is this a false-color image or a true-color image? What does each color represent?*

#### Six Images Record Sheet

- Investigate one other image in depth. Your teacher will assign you to an expert group and tell you which image your group will investigate. My expert image is:



You are responsible for learning as much about this image as possible. Answer the same three questions.

As you are investigating your image, brainstorm with your group about the questions asked in the *Think about It* section below the image's description.

- Share your image with other members of the class. Your teacher will assign you to a cooperative group. Each member of the cooperative group will be an expert in a different image. Share everything you've learned about your image with the rest of the group. As you listen to the other experts, record information about each image. When are you finished, you will have a complete set of information about all six images.

## Looking Closer

### Comparing Two Images

In this activity, you will study two images of Antarctica in-depth.

#### Materials

- Images 1–6 viewed in hard copy or online in the [Image Gallery](#)

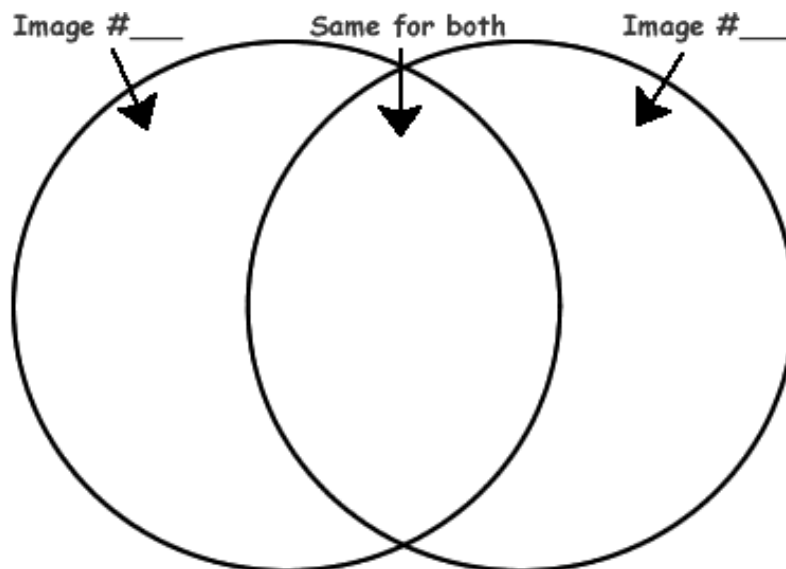
#### Procedure and Record Sheet

- Choose any two images to compare and contrast.
- Look at them side by side, then answer the following questions.

What do the two images have in common?

What can you learn from one image that you cannot learn from the other?

3. Each circle below represents one of your two images. Label both circles. Write the ways the two images are alike in the area where the circles overlap. Write the ways the first image is different in the part of the circle that does not overlap. Do the same for the second image using the other circle. This way of organizing information is called a *Venn diagram*.



## Check for Understanding

### Antarctic Year-Round Studies

Antarctica is in darkness for 6 months of the year and is difficult to get to. Explain how scientists can do year-round studies of Antarctica.

South Pole Station



Summer



Loading supplies in winter