# Picture Perfect

Exploration

**Challenge:** What can people observe and infer from images taken at unknown distances?

**Materials:** a collection of images of various objects

## Let's Dig In:

You will be receiving a collection of images. Before you begin your observations, read through the entire procedure and design a data table in which to record your observations and inferences. While you can discuss each image with a partner, each person will need to record their own data.

For each of the images, brainstorm ideas of what you think the entire image is. Record as many possibilities as you can for each image. Then, for each guess of what the different images are, identify the specific parts of the image that helped you identity of the entire image. Finally, try to determine the size of the image, or the scale of the image, as well as the distance that the camera was from the object when the picture was taken.

## Go Figure:

1. How does the black and white coloration make these pictures more difficult to identify than color images?
2. How can features in these images be identified as different objects, when you are using the same picture?
3. What makes it so difficult to infer the size of the object?
4. How can images like these help researchers and scientists?

Teacher Notes

# Picture Perfect

Exploration

***GEOMES Topic:*** Earth and the Universe – Scale and Distance

| | | | | |
|---|---|---|---|---|
| **Lab setup:** | none | easy | **moderate** | difficult |
| **Reasoning level:** | **easy** | moderate | difficult | |
| **Time required:** | **20-40 minutes** | 40-60 minutes | 60-90 minutes | |
| **Process skills:** | **comparing** | **classifying** | **interpreting data** | **inferring** |

**Objectives:** In this activity, students will be brainstorming and guessing the size, scale, distance and identity of objects from a collection of images.

## National Science Education Standards:

Unifying Concepts and Processes: Evidence, models, and explanation
Science and Technology: Understandings about science and technology
Science in Personal and Social Perspectives: Science and technology in society
History and Nature of Science: Nature of scientific knowledge

**Materials:** digital camera or
access to actual images of satellites, images of remote sensing probes, and images of microscopic scale

## Teaching Strategies:

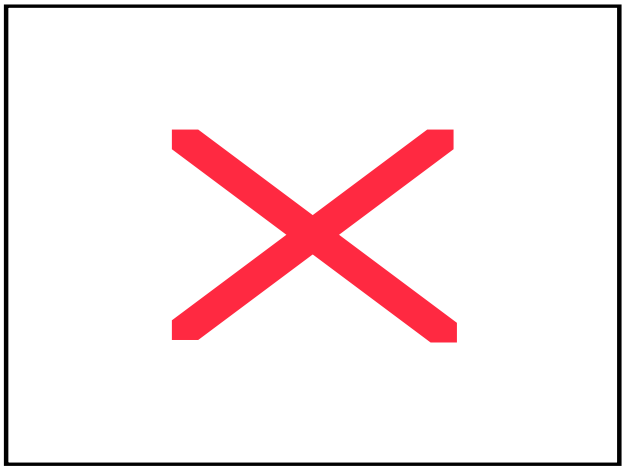
Getting a good collection of images takes some work. Once collected though, you can use the images for the activity year after year. Black and white images actually work better, because this makes it more challenging to tell what the images really are. It is also less expensive to print black and white images and easier to copy them. By placing the images into page protectors, students can use overhead pens to write on the pictures. With these protected copies that students can write and mark on, students tend to be more engaged and produce more ideas during brainstorming. It also simplifies identifying certain features in the images since features can be circled directly on the page protectors and later cleaned off.

There are three major ways to collect the images. You could get the images from books and scan or photocopy them. Finding images from the Internet works best if you go to government sites, such as NASA. The most fun images to make can be done using a digital camera. You choose the objects, scale, size, and distance; even whether you want the images in focus or not. Taking digital pictures of common objects from odd angles and focal lengths can lead to many interesting images. If you had enough cameras, students could create their own images to share with the class.

The contrast of the 3-D objects in 2-D pictures can be difficult to perceive with black and white photos. Suggestions that may lead students to generate more ideas are:

- have students spin the images and look at them from all angles,
- do not label tops or bottoms of the pictures, or title the images,
- have students trade after guessing, and
- have the students work in small groups (2-3) while they brainstorm.

## Sample Data and Observations:



This is actually an image of a ceiling tile, taken from about 1 m away and focused. Some possible brainstorm ideas for this image could be:

- Lakes and ponds from a satellite image
- Boulder field from an aerial photo
- Piece of granite from close range
- Pavement from close range
- Lunar surface from a telescope
- Snowy field with rocks from an aerial photo
- Moss covered rock from close range
- Dunes on a beach

The dark spots on the white background could represent bodies of water, depressions, hills, or locations of plant life. You can have the students circle specific features for identification. For size, scale, and distance, the nature of what the students think the object is will have a great impact. If this was a piece of granite, or some pavement the scale could be 0.5 m and may have been taken from 1m away. If it was a field of boulders or lakes and ponds, the scale could be up to 10 km and taken from 25 km away.

## Sample Responses to Go Figure:

1. The black and white coloration means that you cannot use color in order to identify these images. It is much harder to decipher what the source is when you can only use black and white pictures.
2. When you only know the shape of an object and not its size, you have to guess its size. A wrinkle in a ceiling tile could be seen as a pond, lake, boulder, microorganism, or sand dunes. Without a scale, any shape could be misidentified as almost any object.
3. Without a relative reference to compare the object to, you cannot determine the size of the object in the picture. Unless the distance from the object is given or what the object actually is, any guesses of the size will be just that.
4. There are many things that cannot be seen by the unaided eye. Images of distant objects are the only way we can see some objects. Images of the very small is the only way we can see, since the human eye can only see things down to a certain size. Technology can greatly enhance and even enlarge the perceptions of the world.

## Internet Connection:

The Internet can be a good source of images for use with this activity. Hubble or other telescope images work well, as do electron microscope images.