



Sun-Earth Day

Celebrate the Connection!

Public Outreach - Make and Take Activities

What You'll Need

Your Thumb!

A distant background with texture, such as the outdoors or a wall in a large room with pictures on it.



Experiencing Parallax With Your Thumb

About this Activity

One of the most difficult problems in astronomy is determining the distances to objects in the sky. There are four basic methods of determining distances: radar, parallax, "standard candles," and the Hubble Law. Radar is used to measure distances to relatively nearby solid objects, like the Moon, Mars or Mercury. The Hubble Law and "standard candles" like particular types of variable stars are used to measure the farthest distances. In this activity, we investigate **parallax**, a method that was used historically to measure distances to planets like Venus and Mercury during "**Transits**" of these planets in front of the Sun. The **parallax** technique is also used by precision instruments aboard satellites to measure the distance to the nearest few thousand stars.

You can see the parallax effect in action by holding your thumb out at arm's length and following the simple instructions below.

Part 1:

- Stretch your arm out in front of your face with your thumb extended upwards.
- Leaving your arm still, close your left eye and note where your **thumb** appears in relation to fixed objects in the distance.
- Now close your right eye and open the left. Note that even though you have not moved your thumb, the position of your **thumb** with respect to the background has shifted slightly to the right compared to where it was when only your right eye was open.
- Repeat several times, shifting your view from your left eye to your right eye, and then to your left, back and forth.

This apparent shift in position is known as **parallax**, and your brain uses this information to figure out how far away things are from you.

Part 2:

- Repeat Part 1.
- Now move your thumb so that it is very close to your face, and repeat Part 1 again.
- What do you notice?

The closer your thumb (the object you look at), the more it seems to shift when you switch eyes. Thus the amount of shift (**parallax**) is related to the distance to the object.

Halley's method uses parallax to find our distance to a planet such as Mercury when it transits in front of the Sun. Observers stationed far apart on Earth are represented by your two eyes, Mercury is represented by your thumb, and the Sun is represented by the object(s) in the background.

Related Websites

Transit of Venus Sun-Earth Day Resources Website:
<http://sunearth.gsfc.nasa.gov/sunearthday/2004/>