



Standing in the Shadow of Earth

Night doesn't fall – night rises

About the Activity

Compare the shadow that an Earth globe casts with what we observe in the evening sky at sunset. Show your visitors the shadow of the earth as it rises as a dark blue shadow above the eastern horizon.



Topics Covered

Shadows are not just what we see on the sidewalk, they are 3-dimensional. This activity shows how every night we get covered by the Earth's shadow.

Materials Needed

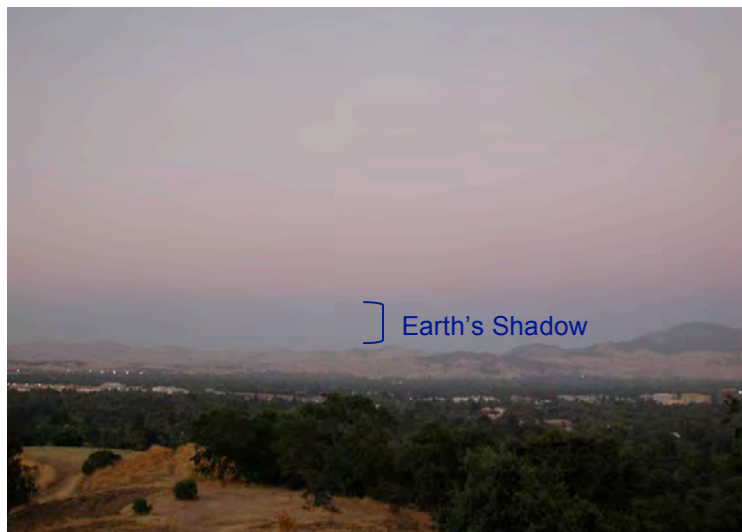
- An Earth Globe
- Flashlight

Participants

Use this activity with families, the general public, and school or youth groups ages 7 and up.

Location and Timing

This activity needs to be done outside, on a clear evening, right at sunset with a view of the Eastern horizon. Observe the shadow once and then again 5-10 minutes later.



<u>Included in This Packet</u>	<u>Page</u>
Detailed Activity Description	2
Background Information	7



Detailed Activity Description

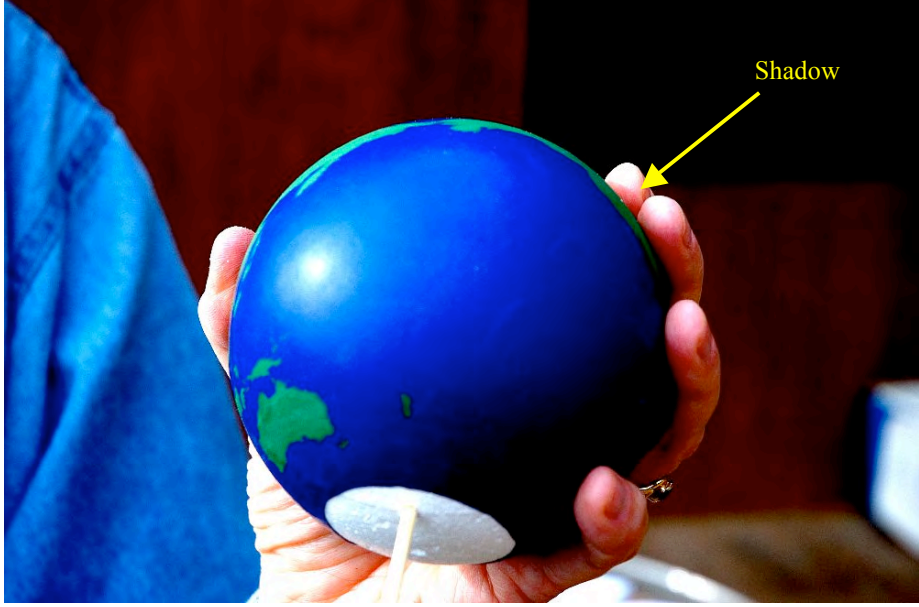
Standing in the shadow of Earth: Night doesn't fall – night rises

Leader's Role	Participants' Role (Anticipated)
<p><u>To say:</u> Do you have a shadow? Where is it? (If it is dark, ask: how can we make you have a shadow?)</p> <p>Does that (tree, house, my telescope) cast a shadow?</p> <p>Why do we have a shadow? Is there a light shining on us? And we are blocking some of that light, so anything that is on the opposite side of us from the light is going to be dark.</p> <p>What is the brightest light we see almost every day?</p> <p><u>To do:</u> Hold up an Earth globe so the Sun or a flashlight is shining on it.</p> <p><u>To say:</u> Does the Sun shine on the Earth? Does the Earth have a shadow? Can you show me Earth's shadow?</p>	<p>Yes There.</p> <p>Yes.</p> <p>Yes.</p> <p>The Sun!</p> <p>Sure It must. Points to dark side or shadow of Earth on the ground.</p>
<p>Misconception Tip: Many children (and some adults) think a shadow is just the visible shadow cast on the ground. They do not think of all the area between the ground and the object as a part of the shadow – They do not conceive of a shadow as being three-dimensional.</p> <p>This is why some people do not think of the night side of the Earth as being in the Earth's shadow.</p> <p>This next exercise demonstrates that the shadow runs all the way from the ground to the object.</p>	




Leader's Role	Participants' Role (Anticipated)
<p><u>To do:</u> Hold your hand in the Earth globe's shadow, a foot or two away from the globe.</p>	
<p><u>To say:</u> Is my hand in the shadow of Earth?</p>	Yes.
<p><u>To do:</u> Move your hand a little closer to the globe, still in the globe's shadow.</p>	
<p><u>To say:</u> Is my hand still in the shadow of Earth?</p>	Yes.
<p><u>To do:</u> Lay your hand on the globe, still in the globe's shadow.</p>	
<p><u>To say:</u> Is my hand still in the shadow of Earth?</p>	Yes.
<p>When are we standing in Earth's shadow? Sure, at night!</p>	When we're over here (indicating dark side)




Leader’s Role	Participants’ Role (Anticipated)
<p><u>To say:</u> When can we see the Earth’s shadow? Almost every evening, you can watch the Earth turn into its shadow.</p> <p><u>To do:</u> (this must be done within an hour before sunset) Place your hand on the globe with your fingers pointed west – toward the sun, over your approximate location on the globe (see photo). Tip the north pole of the globe so it is roughly pointed to where the North Star would be.</p>  <p>Turn the globe so the shadow of the globe starts rising onto your fingers.</p> <p><u>To say:</u> My hand represents Earth’s atmosphere. Just as the Sun sets, we’ll start to see the shadow of Earth appear up against the atmosphere. Just like you see the shadow of this globe up against the ends of my fingers. You’ll see a hazy dark blue band appear on the eastern horizon. That’s the shadow of Earth.</p> <p>Let’s watch for it.</p>	<p>Not sure.</p> <p>Looks to the east.</p>



Leader's Role	Participants' Role (Anticipated)
<p><u>To do:</u> (this must be done immediately after sunset – you need a reasonably clear view of the eastern horizon) Face south with your arms extended east and west.</p> <p><u>To say:</u> Now that you've watched the sunset, turn around and watch the shadow rise. The Earth is turning this way, away from the Sun. (facing south, drop your left (eastern) hand and raise your right (western) hand – see photo)</p>  <p>Everyone face this way and extend your arms. Like you are lying down on the surface of Earth. Now turn – We are moving into the Earth's shadow.</p>	<p>All extend arms.</p>



Leader's Role	Participants' Role (Anticipated)
 <p data-bbox="695 646 911 674">] Earth's Shadow</p> <p data-bbox="235 846 1076 915">See that dark band just above the eastern horizon? That's Earth's shadow.</p> <p data-bbox="235 919 1109 989">Hold you hand out at arm's length. Close one eye and measure how many fingers thick the band is.</p> <p data-bbox="235 993 787 1024">Is it one finger, two, or three fingers thick?</p> <p data-bbox="235 1029 967 1060">As we turn farther, the shadow will appear to get higher.</p>	<p data-bbox="1187 825 1268 856">Wow.</p> <p data-bbox="1187 898 1365 1073">Holds fingers parallel to horizon. About 2 fingers.</p>



Leader's Role	Participants' Role (Anticipated)
<p>(check the shadow again about 5 - 7 minutes later)</p>  <p><i>To say:</i> Hey! Look at the shadow now! Is it higher? How many fingers thick is it now? Night doesn't fall – night rises! And you'll see our Earth's shadow every clear evening. And in an hour or so, we will have turned completely away from the Sun and we'll be standing in the shadow of Earth. And that's called what?</p>	<p>Yeah! Four fingers!</p> <p>Nighttime!</p>

Background Information

For another way to model day and night on the Earth and talk about the shadow of Earth:
<http://128.241.173.3/pubs/mercury/9803/dahlman.html>

