

Radar Mapping: What's in the Box?

Venus has a very dense atmosphere that prevents anyone from seeing its surface. Scientists depend on remote sensing to tell them what Venus' surface is really like; they have mapped out the surface using radar. The Magellan mission orbited Venus and sent radio waves through the clouds; the ground reflected the signals back to the orbiter. The amount of time it took for the radio signal to bounce back indicated how far the ground was below the orbiter.

In this activity, your children will mimic this remote sensing by using a stick to measure the distance to a "planet surface" they cannot see, and creating their own map of that landscape.

What You Need:

- ❖ Several opaque boxes with a landscaped interior and holes in the top
- ❖ Solid items to serve as landscapes, like Styrofoam blocks or cones, Tupperware containers, plastic bottles, etc.
- ❖ Glue to secure the landscape if needed
- ❖ A wooden dowel for each box that is 6" longer than the box is tall
- ❖ A sheet to "Take Your Data"
- ❖ A sheet to "Make Your Map"
- ❖ Permanent markers in several different colors
- ❖ Crayons

How to Set Up Boxes:

- ❖ Copy paper boxes work well. Gather as many boxes as you would like the children to work through.
- ❖ Inside each of the boxes, create an uneven landscape using objects of different heights.
- ❖ On the lids of the boxes, create small holes (large enough for the wooden dowel to slide through easily). Create the number of holes for which you want the children to gather data (for example, a grid of 3 rows of 4 holes across the top of the lid). Number each hole a different number.
- ❖ Mark off the dowel in inches or centimeters. Color each increment a different color, with light colors and low numbers being at the bottom of the dowel and darker colors and higher numbers marking the top segments.

What to Do:

- ❖ Explain to your children that they are going to use the dowel to make a map of what's in the box.
- ❖ Place the dowel through the holes on the top of the box, beginning with the holes in Row 1.

- ⌘ While the dowel is in the box, check which number/color is just above the hole. Have your child record that information on the “Take Your Data” sheet. For instance, in “Row 1, position 1,” you might see that the number 8 (for 8 inches or centimeters) and color blue line up with the top of the box; your child would place a blue dot in the “Row 1” table in the first column (position 1) row, with the number 8 beside it.
- ⌘ Invite your child to repeat this step for the rest of the holes in the box.
- ⌘ After your child has completed their measurements, have them color boxes with the same number the same color – this is a little like painting by number. Often planetary scientists color maps of planetary surfaces such that low areas (higher numbers) are dark (purple, blue, green) and high areas (lower numbers; the dowel did not go far in the box) with lighter colors, like yellow, orange, red, and white.
- ⌘ Help your child make a key to the colors.

Parent Prompts:

What does the landscape in the box look like based on your measurements? Is it flat – did the dowels all go to the same distance? Are there high areas, like hills or mountains where the dowels did not go very far? Low areas like valleys?

Does your map show these high areas? Low areas?

What do you think would be different if you only had one dowel measurement?
Would you be able to say very much about the landscape?

What if you had hundreds of measurements?

How were you able to make a map of something that you couldn't see? (Using the stick to measure the height and depth of the “land.”)

Which planet have scientists mapped out using a similar technique, but with radio waves instead of a dowel? (Venus)

Magellan's radar map of Venus:



Radar Mapping -- Make Your Map

| | | | | | |
|-------|----------|----------|----------|----------|----------|
| Row 1 | ○ | ○ | ○ | ○ | ○ |
| Row 2 | ○ | ○ | ○ | ○ | ○ |
| Row 3 | ○ | ○ | ○ | ○ | ○ |
| | 1 | 2 | 3 | 4 | 5 |

Map Key: