Robogals Science Challenge

Minor Challenge - Activity Sheet

STEM Field	Astronomy
Challenge Name	Make Your Own Telescope
Challenge Level	Junior
Project Cost (approx)	0 - 20 USD

Materials Required	• 2 magnifying glasses with handles (more are optional) - 2.5 - 3 cm (1 - 1.5 inches)
	  ◦ Works best if one is larger than the other
	  ◦ Larger lenses will allow for better images (but don't pick lenses that are too large to handle)
	• 1 cardboard tube
	  ◦ paper towel roll or gift-wrapping paper roll (it helps if it is long)
	• Duct tape
	• Scissors*
	• A ruler, yard stick, or tape measure
	• Sheet of printed paper
	  ◦ newspaper or magazine will do
	• Paper and pens/pencils

Duration (approx)	2 hours

*Some adult supervision is advised with the scissors

Introduction

In this project, you'll get to explore how **lenses** work and how they can make things look **bigger**.

Your eyes can't see things that are very far away because they don't catch enough light. A **telescope** uses special lenses that help gather more light, so faraway things look much closer.

Our telescopes will use two lenses.

- The **first lens** (the big one) catches light from the faraway object and brings it together.
- The **second lens** (the small one) spreads the light back out so the picture looks **bigger and clearer**.

In the picture (Figure 1), you can see the light rays crossing each other. This makes the picture look **upside down**. All lenses do this—even the lenses in your own eyes! But don't worry—your brain flips the picture the right way so you see the world correctly.

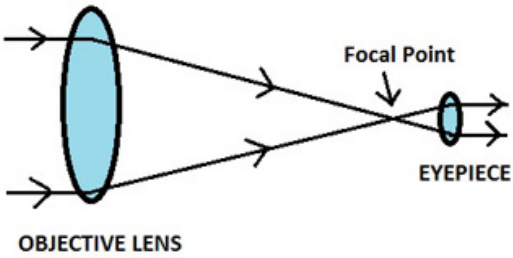

Figure 1. This is a ray diagram that shows how light is directed by lenses to make a far away object appear closer

Instructions

Hold the big magnifying glass between your eye and a piece of paper. Move it until the words look blurry.

Hold the small magnifying glass between your eye and the big one. Move it closer or farther until the words look clear and sharp again.

Ask a grown-up or friend to **measure the space b**etween the two magnifying glasses. **Write the number down** so you don't forget!

Cut a little slot in the front of your cardboard tube. It should be about an inch (2.5 cm) from the end. The handle of the big magnifying glass should fit in the slot so the glass stays in place.

Cut another slot for the small magnifying glass. This slot should be the **same distance** away from the first slot as the number you wrote down.

Instructions

Put the two magnifying glasses into their slots — the big one in the front, the small one in the back—and tape them in so they stay put.

If the cardboard tube sticks out too far behind the small magnifying glass (more than 1–2 cm), **trim the extra cardboard** off.

Test your telescope! Look at some words on a page. You might have to adjust the glasses a tiny bit to make the picture look clear.

Take your telescope outside and look around! See how it makes faraway things look closer.

Extension - Try This Extra Activity

If you have a third magnifying glass, try adding it to your telescope!

- What happens if you put it between the other two glasses?
- What happens if you hold it in front of the telescope?
- Does the picture look bigger? Smaller? Stranger?

Reflection Questions

- What changes would you make to make your telescope even better?
- Where in the real world do people use tools like this?
- What science ideas did you learn while making your telescope?
- If you add another lens, what do you think happens? Does the picture get bigger or smaller? Does it flip upside down again?
- Why do you think bigger lenses help? What do you think happens when you collect more light?

Submission Guidelines

Submit a clear photo of your telescope setup, making sure we can easily see the cardboard tube, the large magnifying glass positioned at the front, and the smaller magnifying glass at the back so the whole design is visible.

Include a short summary explaining how your telescope works and answering each of the reflection questions to show what you learned from the activity.

The submission form is at the bottom of the following webpage: https://sciencechallenge.org.au/index.php/minor-challenges/

Note: If you want to include yourself in the pictures of your Minor Challenge, make sure you ask your parent or guardian first to see if it's okay.

Learn More! Resources

To learn more about the physics that makes this project work check out the link below!
https://thebackyardgnome.com/how-does-a-refracting-telescope-work/

To learn more about the history of telescopes and what they are used for check out this link!
https://www.britannica.com/science/optical-telescope

Bibliography

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