

# MAKE A Telescope

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## LEARNING OBJECTIVES

Students will learn to:

- Build a simple scientific instrument
- Make and record observations with the instrument
- Learn a few simple principles of optics

## MATERIALS NEEDED

- Kit to build a telescope, consisting of a cardboard tube, a lens, and an eyepiece.
- Such kits may be ordered at [Science First](#), where each kit costs about \$73 and includes 10 telescopes (\$7.30 per telescope). These telescopes have a magnification of around 16.

## EDUCATOR'S NOTE

Veteran middle school science teacher Eileen Bendixen writes:

*"Students will love building their own telescopes and then being able to use them. With the new missions to the Moon you may want to have viewing parties at your school where the students look at the Moon with their own telescope. If you are able to find schools in other states or countries to have a viewing party at the same time would make the viewing party even more fun. It could also lead to a discussion about are the different schools seeing a different side of the Moon and the fact we only see one side of the Moon and why."*

## Explore the skies, like Galileo, with a telescope you can make yourself!

### Activities

First, an important safety reminder: NEVER look at the Sun through a telescope or binoculars!

Build your telescope by fitting the lens into one end of the cardboard tube and the eyepiece into the other. Your telescope is, in fact, very similar to the one that Galileo built in 1610. He made his own lenses, but you don't have to do that. (You can see Alan Lightman's visit to the Museo Galileo in Florence in [SEARCHING](#) part 1.)

Look at an object outside the window, such as a tree. You should be able to see it in much more detail than with the naked eye. Can you estimate how much bigger the tree appears with the telescope than with the naked eye? This is called the *magnification* of the telescope.

Next, imagine that the tree is very, very far away, so that you cannot go outside and touch it. Your only knowledge of the tree is what you can see through your telescope. With a pencil and paper, make a drawing of what you see. Galileo drew pictures of the Moon, using his telescope.

If you are able to go outside on a clear night when the Moon is almost full, observe the Moon with your telescope and draw what you see.



# SEARCHING

OUR QUEST FOR MEANING  
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Galileo's drawings of the moon.

## Discussion

The ability to distinguish small details with a telescope is called the telescope's resolving power. A principle of the science of light, called optics, is that the resolving power of a telescope is proportional to the diameter of the lens. That means a lens of twice the diameter of another lens will be able to see details twice as small.

Discuss in class the images of the Moon you saw with your telescope.

- What do you think the dark spots are?
- Compare your drawings of the Moon with Galileo's original drawings from 1610 shown above.

In SEARCHING part 1, Alan asks Dr. Paolo Galluzzi, former Director of the Museo Galileo, why Galileo's discoveries with his early telescopes were so important:

**Alan Lightman:** Why do you think that Galileo's discovery was so revolutionary?

**Paolo Galluzzi:** Well, it was changing something that for millennia were believed out of dispute. And imagine that the Moon was totally different from what poets, scientists, literary man had described before...(that) was something that was really 'breaking news.' (SEARCHING note: Conventional wisdom before Galileo held that the Moon was a pure, white and perfect disk.)

Nobody would've ever arrived at imagining that there were valleys, and there were mountains, on the Moon.

I imagine the first readers of the 'Sidereus' (meaning 'Sidereus Nuncius' or 'Starry Messenger,' written by Galileo) were struck much more from the few images than by the descriptions that he was giving of what he observed."



Dr. Paolo Galluzzi and SEARCHING's host Alan Lightman discuss the historical significance of Galileo's inventions and his resulting discoveries, while Alan holds a replica of an early telescope.