

Techne ~ Project 2: Build a Telescope

Instructions

- ❖ GOAL: To build a working Galilean telescope and use it to observe the heavens.
- ❖ DUE DATE: Project complete by Saturday, November 7
- ❖ SAFETY: Any time spent outdoors exposes us to dangers from weather, animals, and plants. In addition, tools of nearly any type carry with them dangers of one kind or another. These dangers can all be handled through preparedness and prudence. Consult with a parent throughout this project to ensure safety.
- ❖ SUPPORT: You are encouraged to enlist the help of a parent and friends or siblings throughout the project; however, it is essential that the decision making be left to you. You are the captain and it is up to you to decide how things must be done, within reason.
- ❖ PREPARATION: (Read aloud with a parent)

1. Go to this web page:

http://galileo.rice.edu/lib/student_work/astronomy96/mtelescope.html

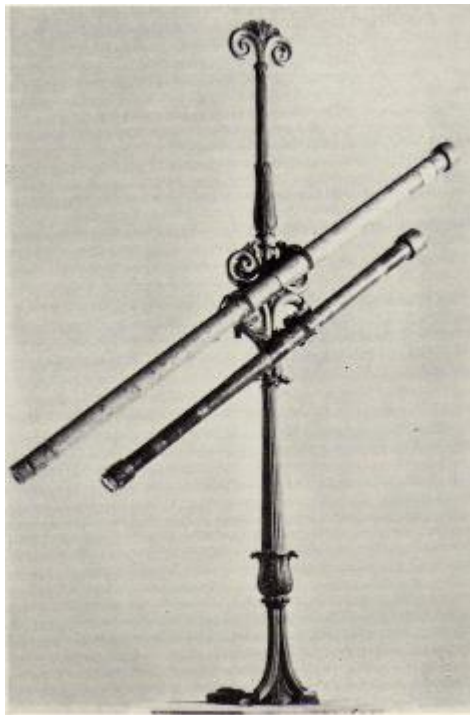
- Read through the entire project description before you start.
- You are required to build the telescope, not a mounting (though building one would be great).
- These directions are the ones I will follow throughout the rest of the instructions here, with the exception of the fact you are using smaller lenses.
- You may choose to build a different scope. Longer length, bigger lenses, and stronger building materials can be used, if you choose. Consult with your parents, be sure you understand how to calculate magnification and focal length, and go for it!
- For additional information about how lenses work see this site:
<http://www.telescope.com/Choosing-Eyepieces/p/99803.uts>
- Here is another really good explanation and instructions for a PVC version.
http://www.phys.hawaii.edu/~aapt/Teacher_Resources/Make_and_Take/PVC_tlescope.pdf
- REMEMBER: **You** are the one who has to figure out the project, so read up and get to building!

2. Purchase your lenses. I could not find anywhere to get lenses that fit the specifications in the instructions. Here is my suggestion:
 - Two Double Convex lenses with a 38 mm diameter; one with a 50 mm focal length and the other with a 500 mm focal length (this gives you a magnification of 10, you could also do the 150 and the 500 for an even lesser magnification)
 - <http://www.hometrainingtools.com/lens-double-convex-50mm-f-l>
 - <http://www.hometrainingtools.com/lens-double-convex-500mm-f-l>
 - You might also look around on amazon to find two lenses you could use—just be aware that the length the scope will need to be calculated for the focal length of the lenses.
3. Once you have your lenses get the tubes.
 - Calculate size: 1 inch equals 25.4 millimeters
 - The length of the telescope reflects the focal length of the larger lens (the objective lens, as it is called)
 - The length of the scope you would build with the two lenses I suggest is approximately 500mm or 19–20 inches long. The original instructions are for a scope about 4 feet long.
 - Keep in mind that you want the focal length of the larger lens to fall right in the middle of the adjustable range of the telescope.
 - The diameter is 38 mm on the lenses I suggest so about 1.5 inches. You would want your outside tube to be slightly larger than the diameter of your lenses so they fit in easily.
 - For material, you could go for the packing tube suggested in the directions or you might pick up some poster board and role your own tubes—be creative and figure it out! Any tubing that you can cut and that you can find in two sizes (one to fit inside the other so it will slide) will work.

❖ EXECUTE THE PROJECT

4. Build it and then try it out!
 - Be prepared to make errors and to require rebuilds.
 - Feel free to play around with variations; to try multiple lenses, if you have them; to figure out how the thing works by trying different things.
 - Observe the moon, since it is the easiest object to find in the night sky.
5. Document the Experience:
 - Shoot some photos, if you want.
 - In a notebook, journal about your experience. Include the following:

- What did you build?
 1. Describe, concisely, exactly what you made (1 short paragraph).
 2. Diagram the telescope showing the insides. Includes lenses, focal lengths, etc.
- What happened?
 1. Write a brief narrative account of your adventure in the form of a journal entry. Begin with the date, time, place, who was there, and then simply tell what happened. There may be several “entries” if you worked on the build over a length of time. (1 lengthy paragraph, or a series of smaller ones)
- What did you learn?
 1. Reflect upon the building process, your time out in the night, and the experience of doing the project, generally. Try to express what you learned about yourself, telescopes, science, observation, or anything else. (1 paragraph)



I cannot locate the source of this sketch, but it is a common depiction of Galileo's telescope. I am presuming it is in the public domain, but will remove it, should that prove not to be the case.