

ROBERSON MUSEUM AND SCIENCE CENTER

Post-Visit Microscopes: Constructing Telescopes

Grade Level: 4th -10th

New York State Standards: M S & T 1, 4, & 5

Pennsylvania State Standards: S & T 3.2 & 3.7

Objective: Students will gain a basic understanding of the history of the telescope and the Hubble telescope. They will be provided with two models of telescopes to build. One model, which is very simple, requires a lens and actually works as a simple telescope. The other is a complex paper model, an exact replica of the Hubble telescope, and should be used for more advanced students.

Materials:

- Lenses (can be purchased through Wards Natural Science 1-800- 962-2660)
- Tape
- Scissors
- Cardboard tubes of varying diameters
- Hubble model pattern (www.hubblesite.org)
- Cardstock
- Craft glue
- 1/8 inch wooden dowel
- Medium weight sandpaper
- Black construction paper
- Ruler
- Pencil
- Black marker
- Silver or gray paint
- Paintbrush

Procedure:

Part I: An Overview of the Telescope Age

- a) Scientific and technological advances have caused telescopes to change significantly over the years. However, it is still unclear exactly what the telescope was like since there is still some confusion about who the inventor of the instrument was. (Have students research Galileo, Kepler, Lippershey or Metius and share their discoveries with the class).
- b) Since the earliest days of astronomy, since the time of Galileo, astronomers have shared a single goal-- to see more, see farther, see deeper. The Hubble Space Telescope's launch in 1990 sped humanity to one of its greatest advances in that journey.
- c) Hubble is a telescope that orbits the Earth sending hundreds of thousands of images back to Earth. It has shed light on many of the great mysteries of astronomy such as the age of the Earth, the identity of quasars, and the existence of dark energy.

d) So why do we need to have a telescope in space? Shifting air pockets in the Earth's atmosphere distort the view of land telescopes. This "atmospheric distortion" is the reason that the stars seem to twinkle when you look up at the sky. By placing a telescope beyond Earth's atmosphere we avoid this.

e) Any scientist in the world can submit a proposal and request time on the Hubble telescope. Ask the class to come up with a proposal they would submit for use with the Hubble Telescope or, as an alternative, have students explore some of the recent findings of the Hubble Telescope.

Part II: Building Telescopes

a) Students can build a simple telescope with a lens. Obtain two cardboard tubes that differ in diameter. Slide one tube into the other so that one of the tubes can move back and forth inside the other one. Find a way (for example tape) to attach the lenses at opposite ends of the tube. Share your telescope with your classmates.

b) For more advanced students, building a non-functioning paper model of the Hubble Telescope will provide a fun and challenging activity. Go to www.hubblesite.org and select paper model under the education section. Download the pdf directions and pattern pieces. Make copies for your students or teams of students. Make sure they follow the directions carefully. This is a long-term (2-3 class period) model building project should you choose to undertake it. Good Luck! Please send us pictures of your results.

Attachments:

Hubblesite Directions & Hubblesite Pattern Pieces

Developed by: Barbara Betza & [www. Hubblesite.org](http://www.Hubblesite.org)

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