

# FAIRBANKS MUSEUM & planetarium

## Space Science Adventurer Badge for the Brownie Group

*Telescopes & Binoculars*

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*The following instructions represent additional resources for continued study of the topics covered in our “Space Science Adventurer Badge for the Brownie Group” online class. All materials are the property of Planetarium Educator Hannah Buckner who created them. Any websites included are the property of the individual website owners and have been reviewed by a Fairbanks Museum & Planetarium educator.*

### Overview & Purpose

At the end of this lesson and after completing the assignment, students should feel confident in being able to describe the types and uses of telescopes and binoculars. Students should be able to recognize the majority of the lesson vocabulary

### Objectives

1. Know that there are various types of telescopes that we can use to observe and study objects in space.
2. Be able to use binoculars or a telescope and understand what is occurring inside.

### Highlights of this Lesson

1. We view the stars with telescopes both on Earth and in from space.
2. There are many types of telescopes, and binoculars are a type of telescope!
3. Light can be bent using lenses to make an image appear bigger or smaller.

### Lesson Vocabulary

1. Telescope → An optical instrument for making distant objects appear larger and therefore nearer. One of the two principal forms (**refracting telescope**) consists essentially of an objective lens set into one end of a tube and an adjustable eyepiece or combination of lenses set into the other end of a tube that slides into the first and through which the

enlarged object is viewed directly; the other form (**reflecting telescope**) has a concave mirror that gathers light from the object and focuses it into an adjustable eyepiece or combination of lenses through which the reflection of the object is enlarged and viewed.

2. Binoculars → an optical device, providing good depth effect, for use with both eyes, consisting of two small telescopes fitted together side by side, each telescope having two prisms between the eyepiece and objective for erecting the image.
3. Eyepiece → the lens or combination of lenses in an optical instrument through which the eye views the image formed by the objective lens or lenses
4. Lens → A piece of transparent substance, usually glass, that has two opposite surfaces either both curved or one curved and one flat, used in an optical device by changing the direction of light rays
5. Diameter → a straight line passed through the center of a circle or sphere and meeting the circumference or surface at each end. In astronomy, diameter is used to describe how big a telescope's main lens is
6. Land-based Telescope → a telescope that collects light on Earth
7. Space-Based Telescope → a telescope that collects light from Space
8. Optics → a branch of physics that deals with the properties and phenomena of both visible and non-visible light
9. Refraction → the bending of light
10. Reflection → the bouncing of light off of a surface
11. Light → a form of energy made of photons that can travel incredibly fast and interacts differently with different types of matter, or stuff

## Materials Needed

1. For Activity 1: A pair of binoculars or a telescope
2. For Activity 2:
  - <https://www.stelvision.com/en/telescope-simulator/>
  - <https://telescopius.com/telescope-simulator>

## Activity

*Today, you will be using a real and/or online telescope! This will help you be able to see the power of light plus a lens and how telescopes have broadened our world--literally. For those that do not have a physical telescope or pair of binoculars, no worries! There are wonderful resources to show you what it is like to look through a 'scope.*

### Activity One:

For this activity, you will need either a telescope or a pair of binoculars. If you have both--great! Make sure that if you are using a telescope, you are doing this at night otherwise you can severely damage your eyes.

1. Look through the eyepiece and try to find either a star, a planet, or the Moon. What do you see? Is it as big/small and detailed as you expected it to be?
2. Repeat this with another object in the sky. Is there anything different about this object than the last one?
3. Look for two more objects and see what you notice about them. Objects in the night sky can appear dimmer, sharper, shakier, or bigger based on how close they are to the Earth and the conditions of our atmosphere. Each night may give you a different appearance of the same object because of water in our atmosphere!

#### Activity Two:

1. First go to StelVision. You will be looking at each object with various telescope diameter sizes. In each box, record what you see or notice for that stellar object at that diameter. If you need, ask a parent for help.

Diameter	Moon	Saturn	The Pleiades	M42 Nebula	M31 Galaxy	M51 Galaxy
153mm						
229mm						
254mm						
305mm						
381mm						
407mm						
508mm						
600mm						

2. Now that you have completed the table, what did you notice as the diameter grew bigger?

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3. Next, go to Telescopius. For this part, I want you to have fun with this and play around with the parameters. This means you should try changing values of the different features. I also recommend doing the 1-minute tutorial with a parent so you can both learn the features of the site together. Try recording what you notice as you play around with the simulator.

If you have any questions regarding this assignment or want to talk at all about anything astronomy-related, feel free to reach me at [hbuckner@fairbanksmuseum.org](mailto:hbuckner@fairbanksmuseum.org).

