

*University of Wyoming*  
*AstroCamp*

*Roof Activities*  
*Introduction to Telescopes*

**Purpose:**

- To introduce students to various telescopes and give them information on how telescopes work.
- To give students the opportunity to use telescopes and exercise their understanding of it's function.
- To allow students to find specific objects using the telescopes on the Physical Science roof.
- To give students the opportunity to work with tools used by college students and professors.

**Wyoming State Science Standards Addressed:**

**Standard 2:**

Students demonstrate knowledge, skills, and habits of mind necessary to safely perform scientific inquiry. Inquiry is the foundation for the development of content, teaching students the use of processes of science that enable them to construct and develop their own knowledge. Inquiry requires appropriate field, classroom, and laboratory experiences with suitable facilities and equipment.

Benchmark 4:

Students recognize the relationship between science and technology in meeting human needs.

Benchmark 5:

Students properly use appropriate scientific and safety equipment, recognize hazards and safety symbols, and observe standard safety procedures.

**Standard 3:**

Students recognize the nature of science, its history, and its connections to personal, social, economic, and political decisions. Historically, scientific events have had significant impacts on our cultural heritage.

**Goals:**

- Students will use their listening skills in order to follow directions.
- Students will recognize parts of a telescope and be able to explain its function.
- Students will recognize the relationship between the human eye and the telescope.
- Students will find specific objects in/near Laramie or in the sky using the telescopes.
- Students will use and compare various lenses compatible with the telescope.
- Students will assist in the set up and tear down of the telescopes.

**Entry Level:**

- Students will need information on what telescopes are and how they work. They will also need information on the types of telescopes and their differences.
- Students will need to know the difference between focal lengths and how they affect what is seen through the eyepiece.
- Students will need an understanding of how to mount telescopes and how to mount the

eyepiece.

Students will need instruction on how to focus, maneuver, and look through the telescope.

### **Supplies:**

Small Telescopes with mounts on roof

Various lenses/eyepieces

Instructors to assist AstroCampers

### **Activities:**

#### **Introduce:**

Telescopes are devices that collect light to make faraway objects appear closer. In other words, they magnify and collect light so we can see faraway objects clearly. They work somewhat like the human eye, however our eye is not big enough to collect enough light to make faraway objects come into focus. If our eye was bigger, we could collect more light given off by objects and create brighter images, then magnify part of the image to stretch over the retina and see those faraway objects. There are two parts of the telescope that make this possible.

- Objective Lens (in refractors) or Primary Mirrors (in reflectors) collect the light from distant objects and brings the light/image to a point or focus.
- Eyepiece Lens takes the light from the point of the lens or mirror and magnifies (spreads it) so the image is spread over our retina.

When the Objective Lens or Primary Mirror and an Eyepiece are combined, a telescope is created.

There are different types of telescopes.

#### **Refractor:**

Have an objective lens that gathers light and bends it into focus.

The incoming light is bent into a bright point.

The eyepiece magnifies the bright point into the size of the pupil.

#### **Reflector:**

Have a primary and secondary mirror

The primary mirror collects the light, reflects it to the secondary mirror which sends the image to the eyepiece.

The secondary mirror appears to block some light from reaching the primary mirror, however the secondary mirror is too small compared to the primary mirror so it doesn't block the image.

#### **Compound:**

Have a mix of refractor and reflector elements in their design.

#### **Eyepieces:**

The eyepiece does many things for the telescope. It produces a sharp image and allows magnification to be changed and determines the field of view. Different focal lengths can change what is seen through the telescope. While observing, have students find a specific object, then change the focal length. Does changing the focal length affect the field of view?

#### **Instruct:**

- Take students to the roof.
- Set up one of the small telescopes and explain step by step how to mount the telescopes and its parts.
- Have students break into small groups and set up their own telescope with the assistance of an AstroCamp counselor or instructor.
- Direct students to look through the eyepiece at their partner, then close up objects, before

placing it on the telescope. What do you see through the eyepiece when it is near something? Faraway?

- Now have students look at the primary mirror. What do they see? Can they find the secondary mirror?
- Place the eyepiece on the telescope and allow students to focus.
- Have students practice pointing the telescope at one place than another.
- Direct students to find specific objects such as the McDonald's sign west of Laramie or WIRO on Jelm Mountain. Is the object upside down, rightside up, sideways? What causes the object to look the way it does when seen through the eyepiece?
- If it gets dark, have student focus on Jupiter or other objects in the sky.
- When all students have used the telescope, and had a chance to change focal lengths/magnification, ask them to carefully remove the eyepieces, dismount, and place the telescope in its case.

**Questions:**

1. What do you see through the eyepiece when it is near something? Faraway?
2. What can you see when you look at the primary mirror? Where is the secondary mirror?
3. How are reflectors different from refractors?
4. What type of telescope are you using?
5. How does focal length affect magnification?
6. Does changing the focal length affect the field of view?

Assist students whenever necessary. Check for understanding by asking students questions about the telescopes as they use them. Answer any questions that may arise while students are given instruction or exploring with the telescopes. If available, use various types of telescopes and allow students to explain the differences between each of them as they use the different types. Make sure each student gets time using the telescope.

Created by Michelle Miller, University of Wyoming AstroCamp June 2006