

## Telescope Anatomy



Adapted from presentation by  
Chuck Patterson, Cheyenne,  
WY, HS teacher

### Essential Questions - You should be able to answer these questions by the end of the PowerPoint.

- ▶ What is the purpose of a telescope?
- ▶ How do refracting telescopes work?
- ▶ How do reflecting telescopes work?
- ▶ Why do we need eyepieces?
- ▶ Which type of telescopes do research astronomers use most often?

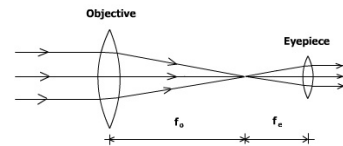
### What is the purpose of Telescopes?

- ▶ The main purpose of a telescope is to collect light.
- ▶ A telescope could be thought of as a light bucket, the bigger the bucket the more light it can collect.



### How do refracting telescopes work?

- ▶ A refracting telescope bends light as it passes through a lens to form an image.
- ▶ Galileo used a refracting telescope.



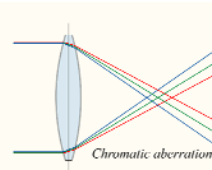
### Advantages of refracting telescopes

- ▶ The optical system is more resistant to misalignment, so it requires less maintenance.
- ▶ The glass surface rarely needs cleaning.
- ▶ The images are steadier and sharper than those from a reflector telescope of the same size.
- ▶ Easier to build, thus cheaper to buy.



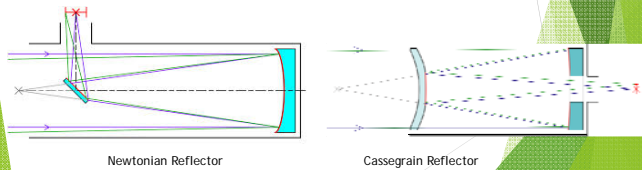
### Disadvantages to refracting telescopes

- ▶ The lenses of refracting telescopes bend different wavelengths different amounts. This will lead to chromatic aberration, which is a rainbow of colors around the image.
- ▶ If the lens gets too large it will sag under its own weight.
- ▶ Certain wavelengths outside the visible light range will be blocked by the lens.



## How do reflecting telescopes work?

- ▶ Reflecting telescopes use mirrors to reflect light to form an image.
- ▶ The first successful reflecting telescope was invented by Isaac Newton



Newtonian Reflector

Cassegrain Reflector

## Advantages of reflecting telescopes

- ▶ Eliminates chromatic aberration
- ▶ Can collect all wavelengths of light
- ▶ Does not sag under its own weight
- ▶ At large sizes, cheaper than refracting telescopes.

## Disadvantages of reflecting telescopes

- ▶ Objects near the edge of view can be distorted.
- ▶ Distortion can affect the shape of an object
- ▶ Stars may appear comet like.
- ▶ The secondary mirror can block a small amount of light from the primary mirror

A modern reflecting telescope



## Eyepieces

- ▶ Telescopes bring light to a point, which is not viewable as an image by the human eye.
- ▶ Eyepieces turn the point into an image.
- ▶ Eyepieces magnify the image: smaller eyepiece focal length = bigger magnification (power).
- ▶ Focal lengths range from 32mm to 5mm, typically 10x-100x power depending on the telescope.
- ▶ Two commercial diameters: 1.25" or 2".



## Which type of telescope is most often used by astronomers? What do you think and why?

- ▶ Reflecting are used more often for research.
- ▶ Eyepiece is replaced with a digital camera or other devices.



## Essential Questions - Review of the Lecture

- ▶ What is the purpose of a telescope?
- ▶ How do refracting telescopes work?
- ▶ How do reflecting telescopes work?
- ▶ Why do we need eyepieces?
- ▶ Which type of telescopes do astronomer researchers use most often?