

# Telescopes, Eyepieces and Accessories

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## **Recognise different Telescopes, Mounts and Accessories.**

Binoculars.

Refractors. Refracting Telescopes.

Reflectors. Reflecting Telescopes.

Light path in both types.

Other types of telescopes. – Catadioptric, Hybrids.

Telescope Mounts. Alt-azimuth, Dobsonians, Equatorial.

Telescope Accessories.

## Binoculars and Telescopes.

**What is  
the main purpose  
of a telescope?**

## **Binoculars and Telescopes.**

**The main purpose of a telescope is...**

**...To collect more light.**

## **Binoculars and Telescopes.**

**What Telescope Should I get?**

**What Car Should I get?**

## **Binoculars and Telescopes.**

**What are you interested in doing?**

**Observing**

**Imaging**

**Moon & Planets**

**Fainter deep sky objects**

## **Binoculars and Telescopes.**

**There are so many different  
types of telescopes available**

**Reflectors**

**Refractors**

**Hybrid Systems**

## Binoculars and Telescopes.

Hybrid telescopes use a combination of lenses and / or mirrors.

Catadioptrics.

Makzutov Newtonians.

Dall-Kirkhams.

Cassegraines.

Many, many others...



## Binoculars.

Simplest and cheapest form of instrument.  
Two refracting telescopes side-by-side.

Highly recommended for beginners.

Come in many varieties – 10 x 50.

10 = Magnification.

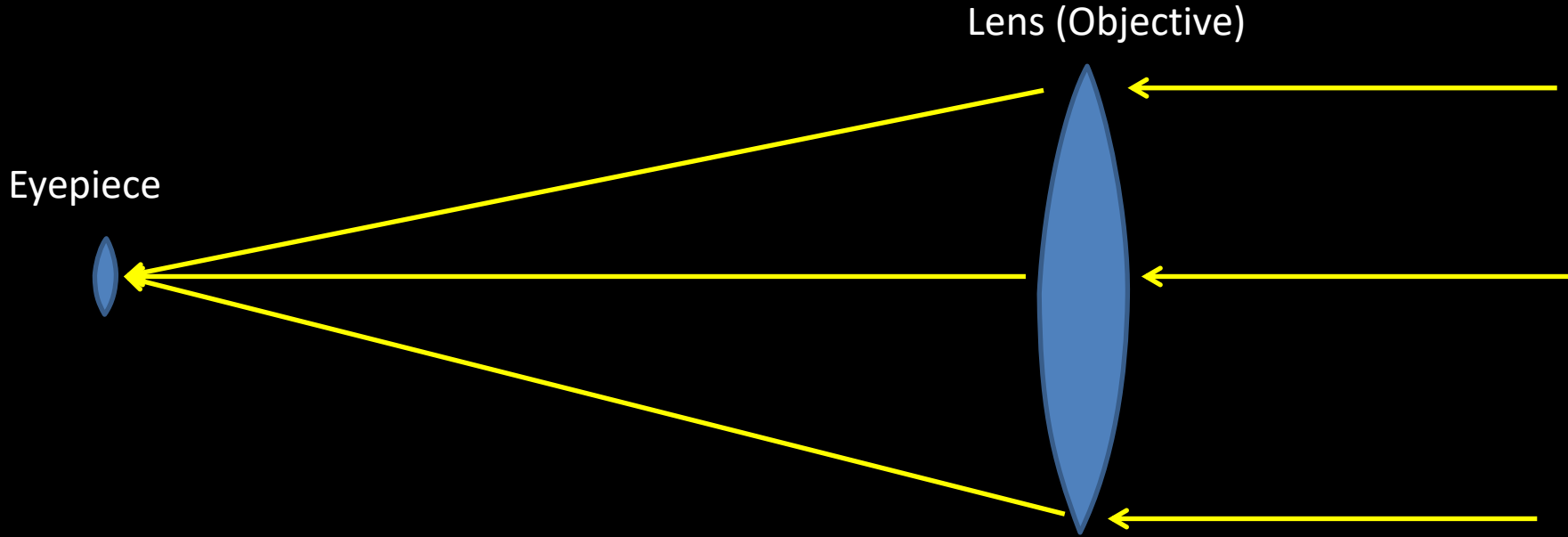
50 = Diameter of front lens in mm.

May also have field of view on them.



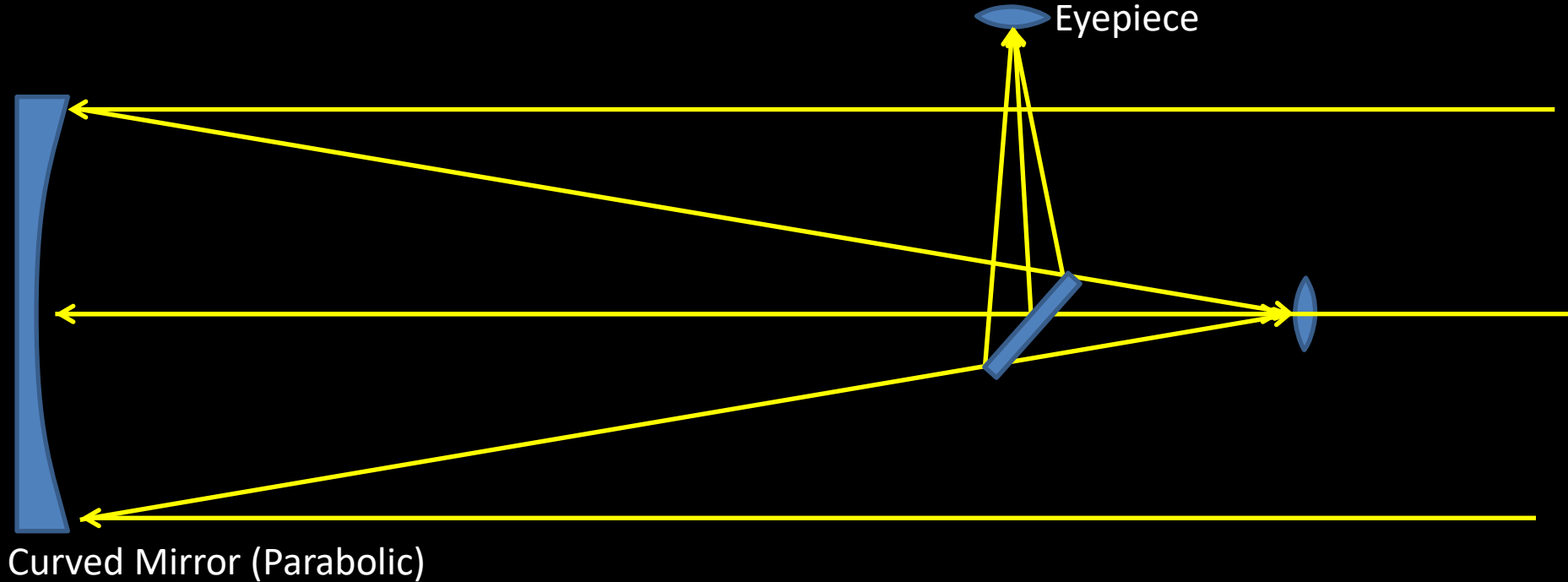
## Refracting Telescopes - Refractors.

Use a lens at the sky end of the telescope to bend the light.



## Reflecting Telescopes - Reflectors.

Use a mirror at the bottom of the telescope to bend the light.

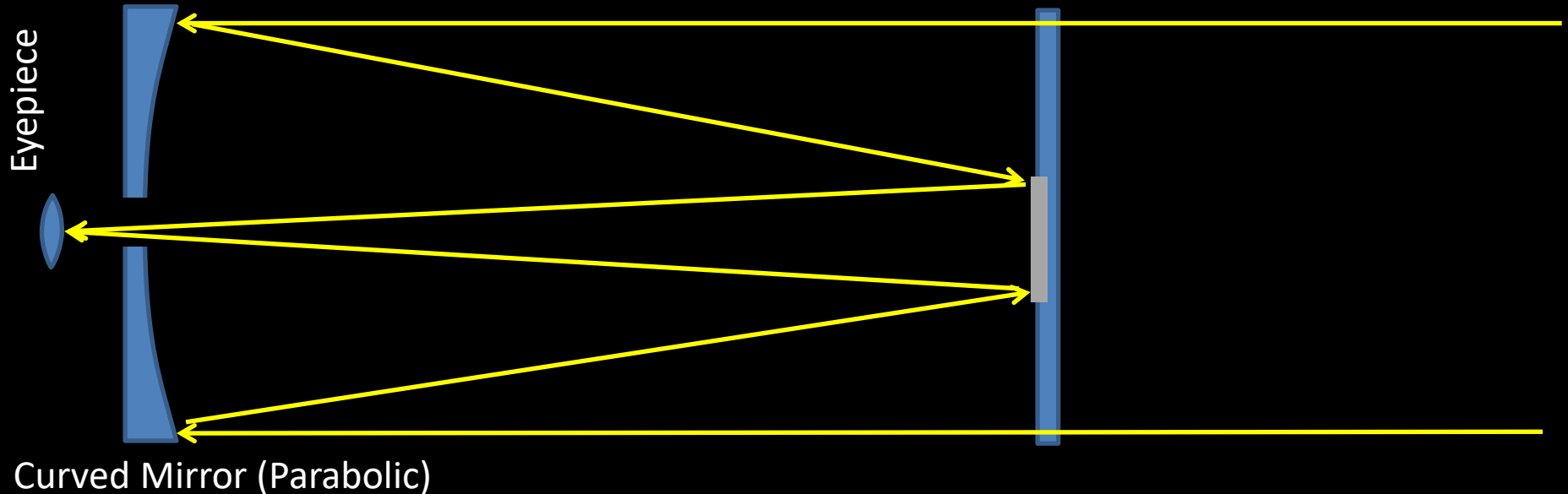


## Reflecting Telescopes – Schmidt Cassegrain's (SCT's).

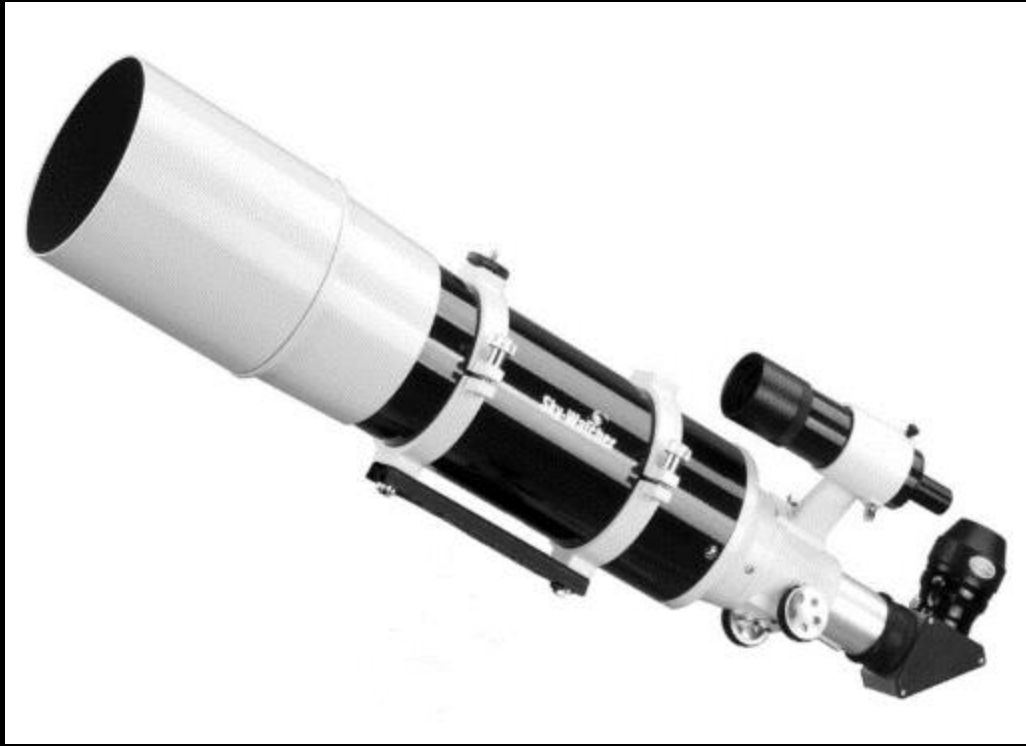
Use a Corrector plate at the top of the telescope to bend the light.

A mirror at the bottom of the telescope.

Plus a curved secondary mirror in the middle of the corrector.



## Refractors & Reflectors.



## **Refractors & Reflectors.**

Reflectors much cheaper per aperture.

An 8 inch reflector is much, much cheaper than an 8inch refractor.

Refractors –Two main types.

Achromats – Simpler lenses – usually show some false colour.  
(A bit cheaper).

Apochromats – Less false colour.  
(More expensive).

Doublets, Triplets, types of glass etc...

## **Refractors & Reflectors.**

Many scopes produce some coma

Stars are stretched out towards the edges.

This can usually be corrected using a coma corrector.

Some Coma Correctors are also focal reducers.

These shorten the focal length of the telescope.

## Telescopes.

The longer the focal length of the telescope,  
the higher the magnification.

This will give a narrower field of view  
and a fainter image.

The longer the focal length of the eyepiece,  
the lower the magnification.

This will give a wider field of view  
and a brighter image.



## Telescopes – Focal Ratio.

The focal ratio (f-ratio) of a telescope

The focal length of the telescope (mm).

The aperture of the telescope (mm).

A small number = a “fast” system  
ie – Gives a brighter image

A large number = a “slow” system  
ie – Gives a fainter image

## Telescope Mounts.

A telescope is useless unless it has a stable mount.

**Two main types.**

Alt-Azimuth.

Equatorial.

## Alt-Azimuth Mount.

Simple and easy to make.

Most popular is a Dobsonian.

Named after John Dobson.

Usually a Newtonian reflector set in a cradle.

Move up and down. (Altitude). **Alt.**

Move around. (Azimuth). **Az.**



## Equatorial Mount.

Aligned with the Earth's axis.

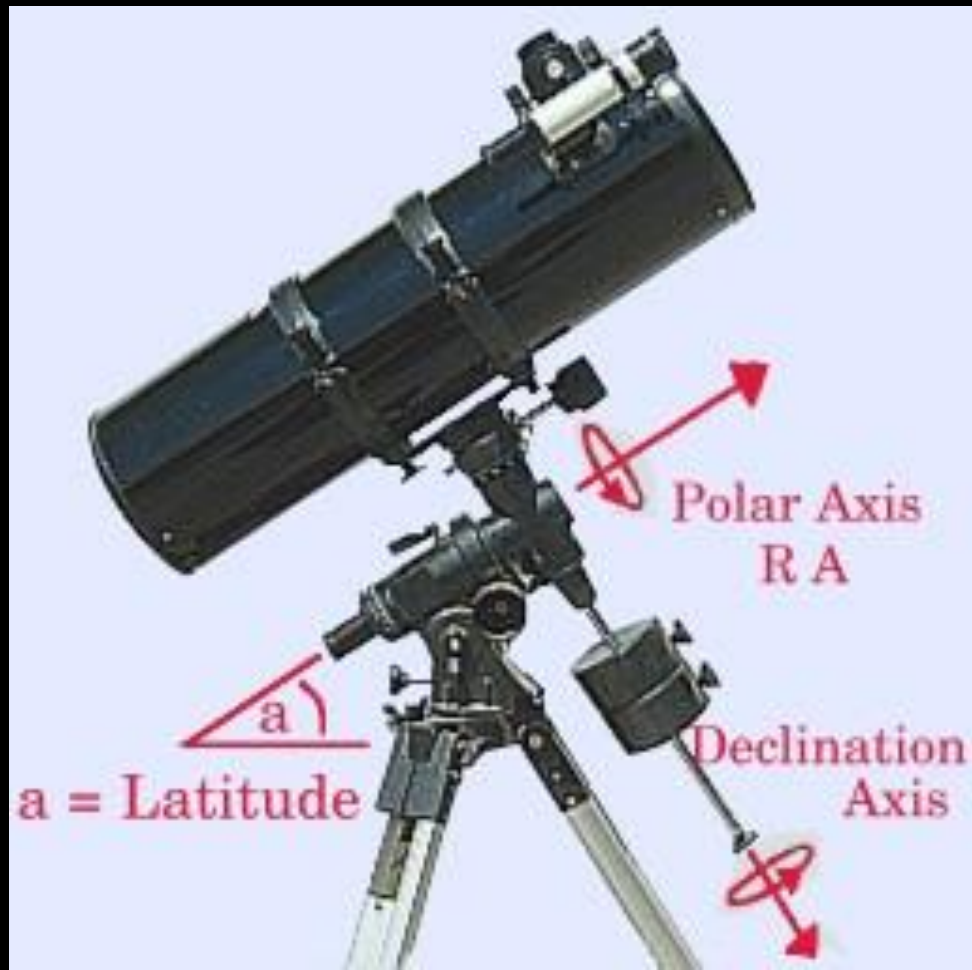
More expensive than Alt-Az.

Can be tricky to set up and get used to using.

Can track the stars very accurately especially if you use computer control.

Makes astrophotography much easier.

## Equatorial Mount.



## Telescope accessories - Eyepieces.

Eyepieces.

Focal length determines magnification of telescope.

Higher number = Longer focal length = Lower magnification.

Formula:

$$\frac{\text{Focal length of telescope}}{\text{Focal length of eyepiece}}$$



## Telescope accessories - Eyepieces.

Use the formula

$$\frac{\text{Focal length of telescope}}{\text{Focal length of eyepiece}}$$

To work out the magnification of  
different eyepieces  
on different telescopes.

## Telescope accessories - Eyepieces.

Formula:

$$\frac{\text{Focal length of telescope}}{\text{Focal length of eyepiece}}$$

$$\frac{1000}{25} = 40 \quad \frac{1000}{15} = 67$$

$$\frac{800}{25} = 32 \quad \frac{800}{15} = 53$$



## Telescope accessories - Eyepieces.

Increasing magnification will enlarge image.

The image will get dimmer.  
But can help get better contrast.

Tracking becomes more crucial.

Maximum magnification  $\sim 300x$ .

Atmosphere Disturbance.

## Telescope accessories – Eyepieces.

Other measurements are:

Eye Relief in mm

The longer the eye relief,  
the further away from the eyepiece you eye can be

A longer eye relief is better if you wear glasses

## Telescope accessories – Eyepieces.

There are lots of different types of eyepieces.

Plössls

Erfles

Orthoscopics

Nagler's

## Telescope accessories – Eyepieces.

Other measurements are:

Field of View in degrees



## Telescope accessories – Eyepieces.

Eye prescriptions

Re-Focusing can fix long and short-sightedness

So, you will not need to wear your glasses

Astigmatism cannot be corrected as easily,  
So you will need to wear glasses when observing

## Telescope accessories – Eyepieces.

Many scopes come supplied with eyepieces

These are not always of the best quality

But they do get you going

The image can often be improved by better quality eyepieces

But they will not improve the image quality of a bad telescope

## Telescope accessories – Barlow Lens.

Different Types.

Barlow Lens.

Powermate (Tele Vue).

## Telescope accessories – Barlow Lens.

Increases the effective focal length of telescope.

Come in different magnifications.

1.5x, 2x, 3x, 5x etc.

Magnifies the image produced by the eyepiece.

### Disadvantages:

Magnifies wobbles, atmospheric disturbance and tracking errors.

Image is fainter.



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