Telescopes

- Refractors

Advantages

- Stable - good for long term projects.
- Long focal length - higher magnification - good for planetary work

Disadvantages

- Glass must be of good quality
- Two surfaces to grind and polish
- Cannot be too big
- Has chromatic aberration

- Reflectors

Advantages

- Can be made big
- One surface to grind and polish
- No chromatic aberration

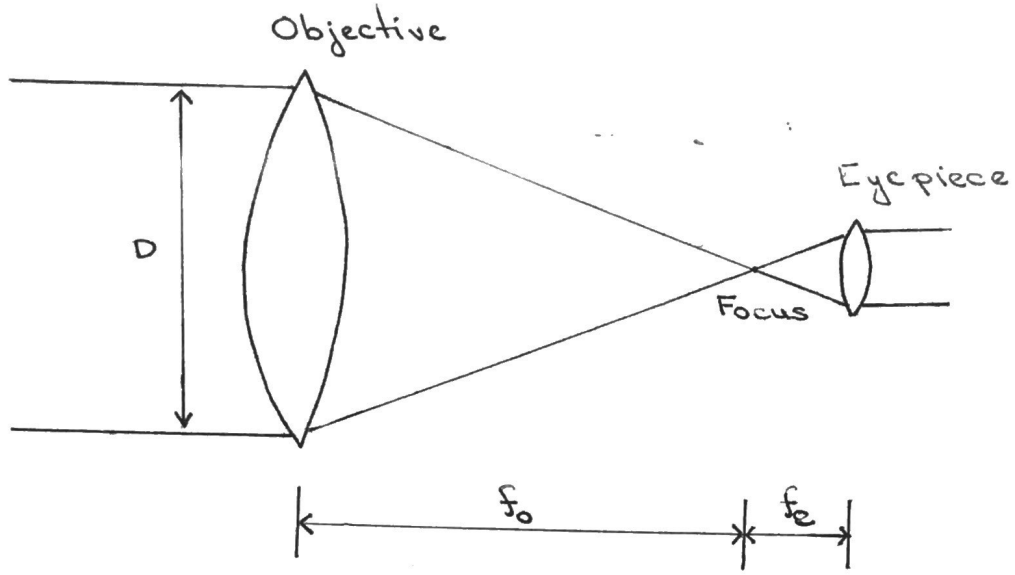
Disadvantages

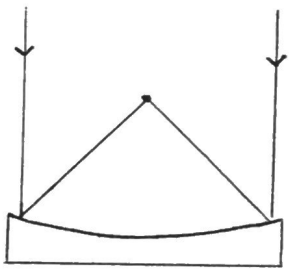
- Mirror has to be aluminized frequently
- Loss of light due to multiple reflections

Prime Focus : Least amount of light loss. Is used to observe very faint objects.

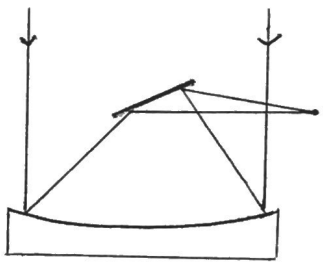
Cassegrain Focus : Convenient focus for attaching light to medium weight equipment.

Coude Focus : A lot of light is lost. Can observe only bright objects. Can use heavy equipment.

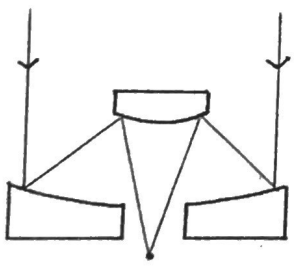




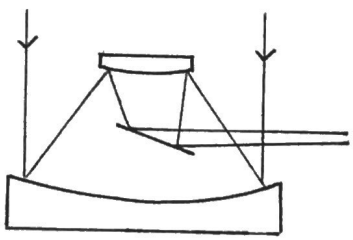
Prime Focus



Newtonian Focus



Cassegrain Focus



Coudé Focus

- General Properties of Telescopes

D = diameter of objective
f_o = focal length of objective
f_e = focal length of eyepiece

- Light Gathering Power (LGP)

α Area of objective α D^2

- Resolution - ability to make out details

Size of image : $\alpha'' / 206265 = 1.2 \lambda / D$

[λ, D must be in the same units]

Seeing = angular size of an image as affected by the turbulence in the earth's atmosphere

Resolution α D / λ

But resolution cannot be improved arbitrarily by increasing the diameter (D) of the objective. It is limited by the turbulence in the earth's atmosphere (or seeing). Best seeing ~ 1"

- Magnification

Magnifying Power = f_o / f_e

Magnification cannot be increased arbitrarily because

- seeing
- higher magnification makes images fainter
- image not resolved by objective

Useful magnification ~ 20 x centimeter of aperture

- Instruments attached to Telescopes
  - Cameras

    Detector : a) photographic plate
    b) electronic device like CCD's

  - Photometers

    A photon counting device which measures the amount of energy received on earth from a celestial object.

  - Spectrograph

    Instrument for recording spectra