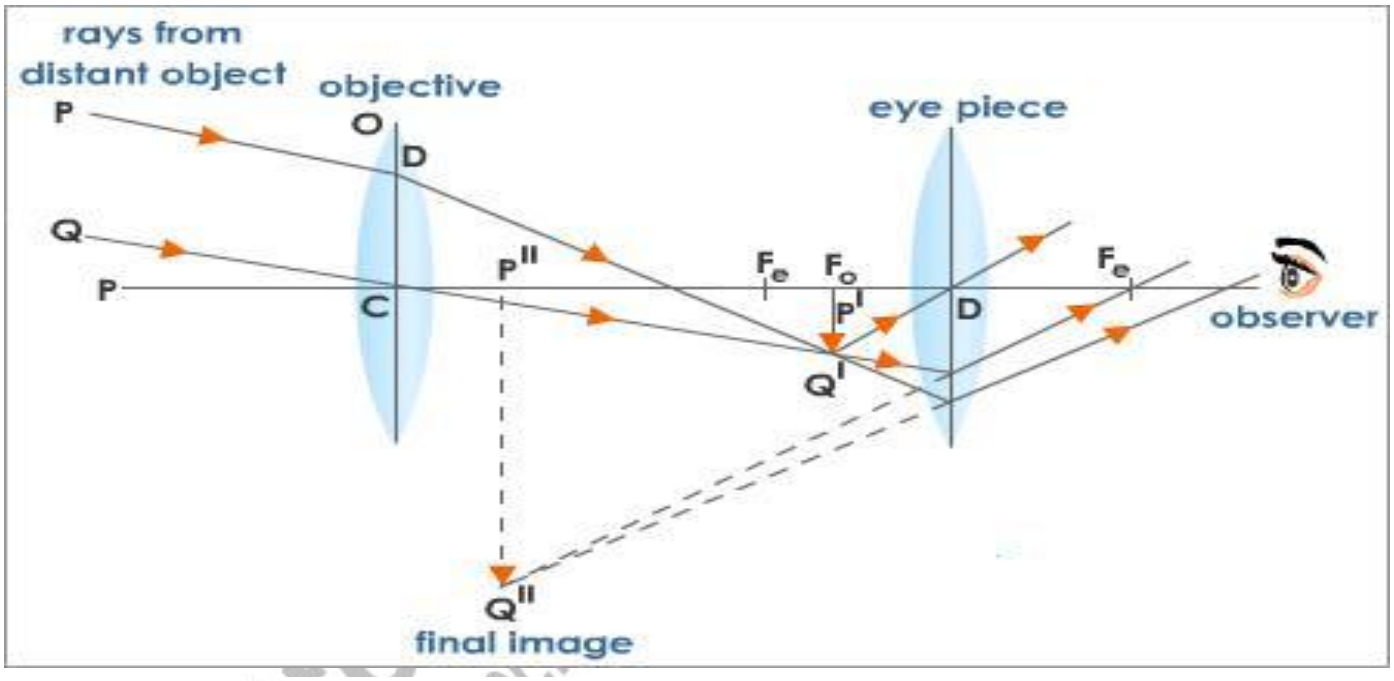
Astronomical Telescope:

It consists of two convex lenses called objective and eyepiece. The objective is of large focal length whereas the eyepiece is of short focal length. The distance between the two lenses can be adjusted by adjusting the tube which holds the lens.

The ray diagram showing the principle of the astronomical telescope is given below.



Ray diagram of Astronomical Telescope

Working OR Image Formation:

The rays of light coming from a distant object (PQ) form a parallel beam of light. This parallel beam of light is focused by the objective in a plane passing through its focus and perpendicular to the axis and forms the image (P^IQ^I). This plane is known as focal plane. The eyepiece is adjusted so that the image P^IQ^I lies in its focal plane. The light beam after striking the eye lens emerges parallel and final image $P^{II}Q^{II}$ is formed at infinity. This adjustment of the telescope is known as normal adjustment.

Magnifying Power of an Astronomical Telescope:

Magnifying power of an astronomical telescope may be defined as the ratio of the angle subtended at the eye by the image to the angle subtended at the eye by the object.

$$\text{Magnifying power} = \frac{\text{angle subtended at the eye by the image}}{\text{angle subtended at the eye by the object}}$$

$$m = \frac{\angle P'DQ'}{\angle P'CQ'} = \frac{\tan \angle P'DQ'}{\tan \angle P'CQ'} \left[\begin{array}{r}\text{When } \theta \text{ is small and in radian} \\ \text{measure } \theta = \tan \theta\end{array}\right]$$

$$m = \frac{P'Q'}{P'D} \times \frac{P'C}{P'Q'}$$

$$= \frac{P'C}{P'D}$$

$$= \frac{f_o}{f_e}$$

From the ray diagram we know that:

P'C is the focal length of the objective and P'D is the focal length of the eye piece.

$$\therefore \quad m = \frac{f_o}{f_e}$$

Difference between Compound Microscope and an Astronomical Telescope

Compound microscope	**Astronomical telescope**
Objective lens has smaller focal length, than the eyepiece	Objective lens has larger focal length than the eyepiece
Distance between the objective lens and the eyepiece is greater than $f_0 + f_e$	Distance between the objective lens and the eyepiece is equal to $f_0 + f_e$
It is used to see very small objects	It is used to see distant astronomical objects