1V. Telescope design and performance – continued

After reading Chapter 3 and reviewing these notes from Lecture 5, you should be familiar with the basic function of an astronomical telescope and its most important constituent parts, and with some of the problems associated with telescope construction and design. Go back and look at Fig 2.2 to remind yourself which types of radiation can only be detected from space.

Most all large telescopes now use reflecting mirrors rather than refracting lenses. Several different designs have been developed to extract the EM radiation from the telescope once it has been reflected off of the primary mirror; the most popular designs (e.g. Cassegrain, Newtonian, Naysmith focus) are discussed on p.42-3 of your book.

The diagram below illustrates both the basic function of the primary mirror (to gather light from a fixed direction in space and bring it to a common focus), and the concept of resolution (the ability to distinguish radiation coming from 2 different directions by their different focal points).

![Diagram of telescope function and resolution](image)

V. The Competing Problems of Telescope Design

**Bigger:**
A. The bigger the better the ability to see faint objects -- light gathering power $\propto D^2$
B. The bigger the better the ability to resolve objects -- angular resolution $\propto \lambda / D$

**Smaller:**
A. To be a telescope the primary mirror must be smooth to better than $\lambda / 10$!
B. The larger the primary mirror the greater the deforming effect of gravity and the greater the cost of protecting the primary mirror from harm.
C. Even for designs which are theoretically possible, the cost of a large primary mirror can be “prohibitive”. For telescopes that must be in space, the cost-per-diameter factor can not only be prohibitive, but the size can eventually be limited due to the constraints imposed by the launch vehicle.