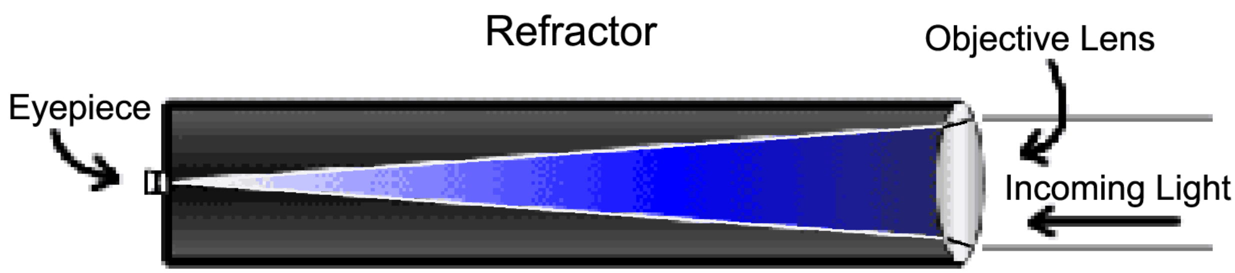


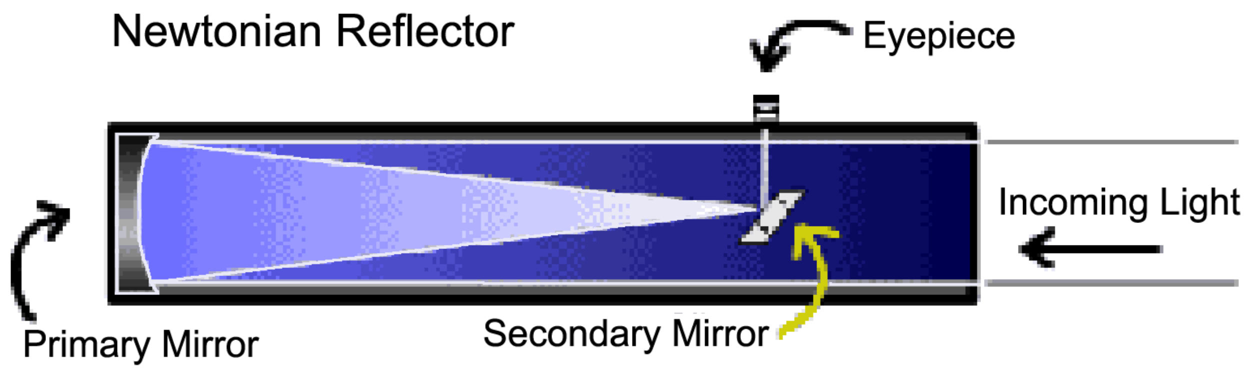
REFRACTOR (lens system)

Advantages

- No light-path obstruction
- Potentially provides the best images

Disadvantages

- Some show "chromatic aberration" - colored halos around objects
- Large ones are BIG
- Can be expensive



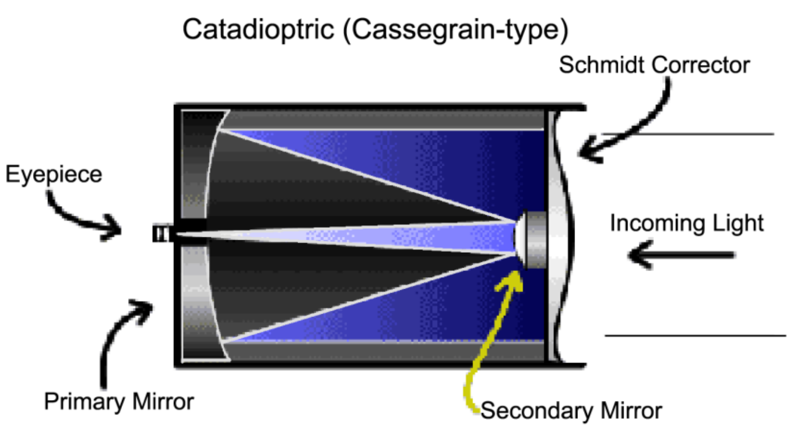
REFLECTOR (mirror system)

Advantages

- Least expensive
- High portability
- No chromatic aberration (colored halos around images)

Disadvantages

- Some light block by secondary mirror
- Can require frequent collimation (alignment of optics)
- Larger than Cassegrain-types



CASSEGRAIN-TYPE
(mirror/lens)

Advantages

- Compact design
- High portability
- Can be computer-driven
- Middle of price range

Disadvantages

- Potential for least clarity of image
- Subject to dew problems

HOW TELESCOPES WORK

- Telescopes gather light, like a “light bucket”
- Curved optic bends parallel light rays into “light cone”, forming tiny, intensified image of object at tip of light cone
- Length of “light cone” called focal length (flT); determined by shape of optic curve; mm (millimeters)
- Eyepieces are mini refractors
- Eyepiece focal length (flE) measured in mm (millimeters)
- Focal length of scope in conjunction with focal length of eyepiece determines magnification.

MAGNIFICATION (POWER)

- Size of object when viewed through telescope compared to viewing with un-aided eye
  - Object viewed through telescope looks 48 times bigger than viewed with un-aided eye = 48 power or 48 times magnified(48x)
- Defined by relationship between focal length of telescope (flT) and focal length of eyepiece(s) (flE)

LIMITS OF POWER

- Under ideal conditions
  - Approximately 50 to 60 power per inch of aperture (primary optic diameter)
  - 8-inch telescope = 8”x50 to 8”x60 = 400 to 480 power
- Many night-sky objects need low magnification because they are dim, faint, fuzzy: nebulae, galaxies

TECHNICAL DETAILS OF MAGNIFICATION OR POWER

- Defined by relationship between focal length of telescope (flT) and focal length of eyepieces (flE)
- The Equation:
  - flT / flE = magnification of eyepiece
- Magnification can change on same telescope when different eyepieces are used

USING MAGNIFICATION

- Higher magnification
  - Reduces image brightness, sharpness and detail
  - Shows blurrier, fuzzier, poorer quality images
  - Only 1/4 the brightness and 1/2 the sharpness coming through eyepiece
  - Sees a smaller field of view (fov) in eyepiece
- Lower powers
  - Give clearest images
  - Show larger portion of sky (fov)

FIGURE MAGNIFICATION

- A telescope has focal length (flT) of 2000mm, with two eyepieces at:
  - Focal length #1 (flE1) = 26mm
  - Focal length #2 (flE2) = 40mm
- Divide focal length of scope (flT) by focal length of each eyepiece (flE)

FIELD OF VIEW (fov)

- Describes how much of sky is seen through eyepiece
- Lower magnification = larger field of view (flT / flE1)
  - 2000mm / 40mm = 50 times magnified
- Higher magnification = smaller field of view (flT / flE2)
  - 2000mm / 26mm = 76.92 times magnified
- Which would you use to begin your observing session?