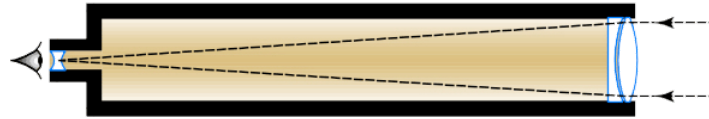


## 5.5: Telescope Optical Types

The type of telescope primarily depends on the optical combinations used to collect the incoming light or Electromagnetic Radiation (EMR). The **Refracting Telescope** or **Refractor** uses a lens or lenses as the telescope's Primary Objective. **Binoculars** are a type of Refractor; occasionally you will find reflecting binoculars.

### Graphic of Refractor



The Achromatic RefractorImage courtesy Mike Reynolds, Ph. D. of Florida State College of Jacksonville.

The **Reflecting Telescope** or **Reflector** uses a concave mirror as the telescope's Primary Objective, rather than a lens or lenses. The type of reflector depends on other system mirror(s), called the Secondary Mirror.

A **Compound** or **Catadioptric Telescope** uses a combination of Refractor and Reflector characteristics. **Radio Telescopes** are attuned to the radio end of the spectrum; it turns out that many objects produce a radio emission.

Specific Wavelength-Sensitive Telescopes are those attuned to specific regions of the spectrum; such as infrared (IR), ultraviolet (UV), and microwave.

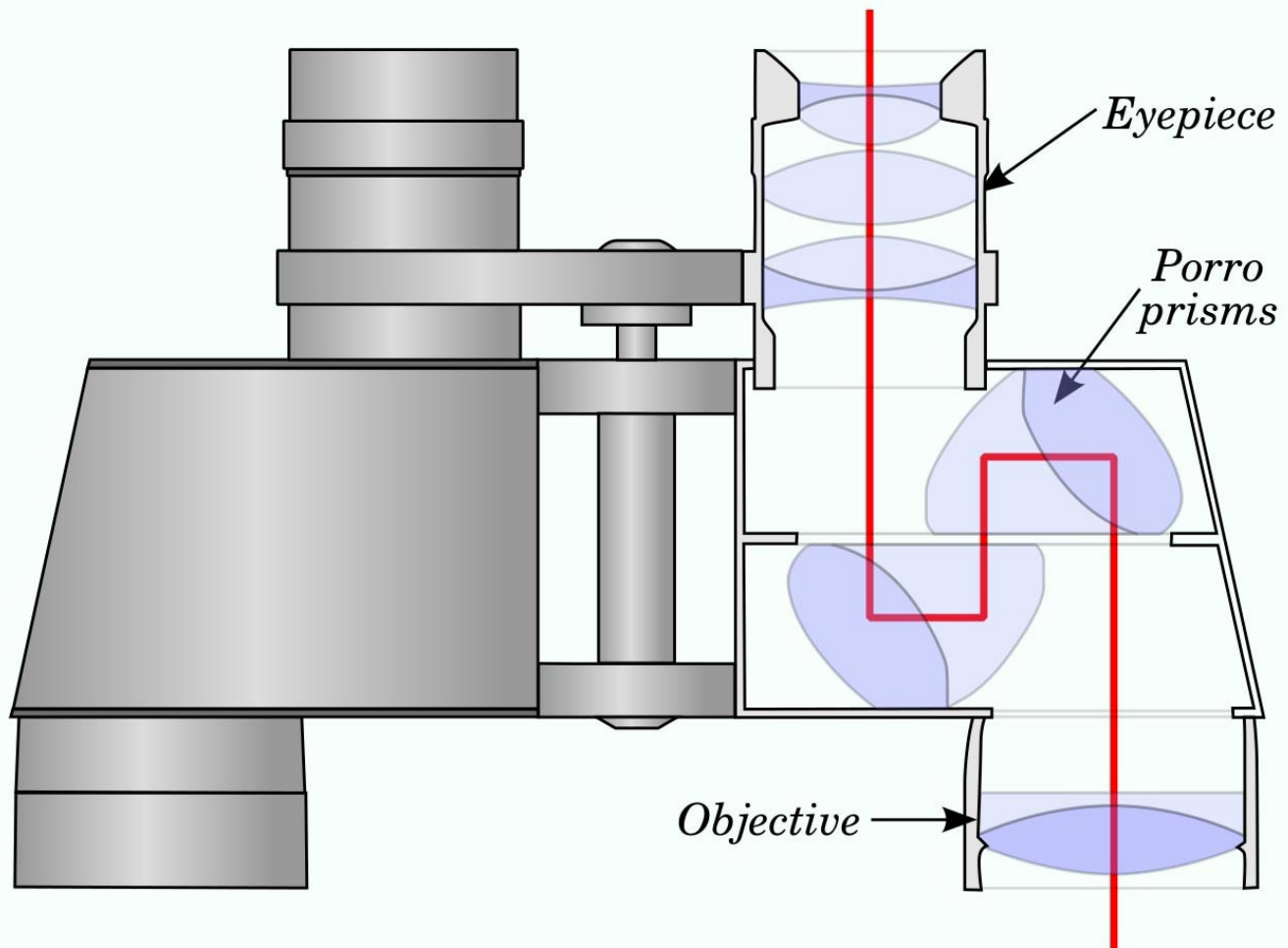
**Gamma-Ray Telescopes** are used for detecting the gamma-ray part of the Electromagnetic Spectrum. These can detect very high-energy gamma-rays from radio galaxies, gamma-ray bursts from stars, supernovae events, and Quasars.

The refractor works by two lenses first gathering and directing the light (right); Galileo's refractor only used one lens. The eyepiece on the left focuses the light for the eye (or camera, spectrometer, etc. )

The binocular primarily uses refractor-like qualities with prisms to upright and fold the image.

### Refractor Example

# Refractor Example



CC BY-SA 3.0 | Image courtesy of Wikimedia Author: Turnvater Jahn.

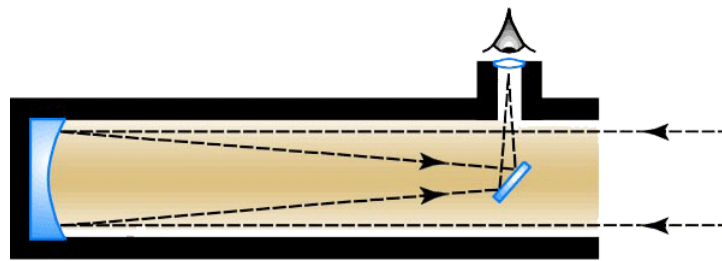
The Newtonian reflector works first by light entering the telescope at the right and traveling to a concave mirror. Graphics of a concave and convex mirror are shown as reference points.

The light is then reflected back to a smaller, second flat mirror and reflected out of the side of the telescope to the eyepiece and the eye.

The Newtonian reflector works first by light entering the telescope at the right and traveling to a concave mirror. Graphics of a concave and convex mirror are shown as reference points.

The light is then reflected back to a smaller, second flat mirror and reflected out of the side of the telescope to the eyepiece and the eye.

[Graphic of Newtonian Reflector](#)

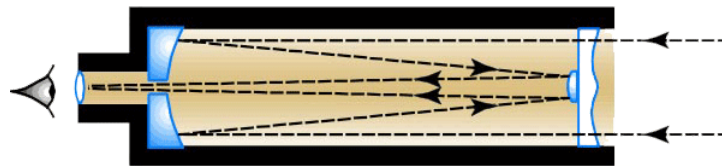


The Newtonian ReflectorImage courtesy Mike Reynolds, Ph. D. of Florida State College of Jacksonville.

Reflectors use a concave mirror as its primary objective to focus the incoming light (same optical focusing effect as a convex lens). The mirror is coated on the surface of the glass, called a First Surface Mirror; the coating is usually molecules-thick coating of Aluminum or Silver. Household mirrors are coated on the back of the glass, called a Second Surface Mirror.

Reflector telescope types differ based on what happens to the light after it is reflected from the primary.

### Graphic of Newtonian Reflector



The Compound ReflectorImage courtesy Mike Reynolds, Ph. D. of Florida State College of Jacksonville.

Light enters the telescope at the right and travels to a concave mirror. The light is then reflected back to a smaller, second convex mirror. The light is then reflected back again out of the back of the telescope to the eyepiece and the eye.

Like the Reflector, uses a concave mirror as its primary objective to focus the incoming light. A corrector plate is placed at the front of the tube; it corrects for primary mirror's shortcomings. Usually compound telescopes have a shorter tube than comparable reflectors; yet they are more expensive inch-per-inch than ian reflectors.

The Compound Reflector, or Schmidt-Cassegrai, is also Called Catadioptric Telescopes.

### Refractor versus Reflector

#### Refractor Telescope

Positive

- *Negative*
  - *Positive*
    - *Negative*
      - *Note: The refractor's positive features are the reflector's negative features and vice-versa.*



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