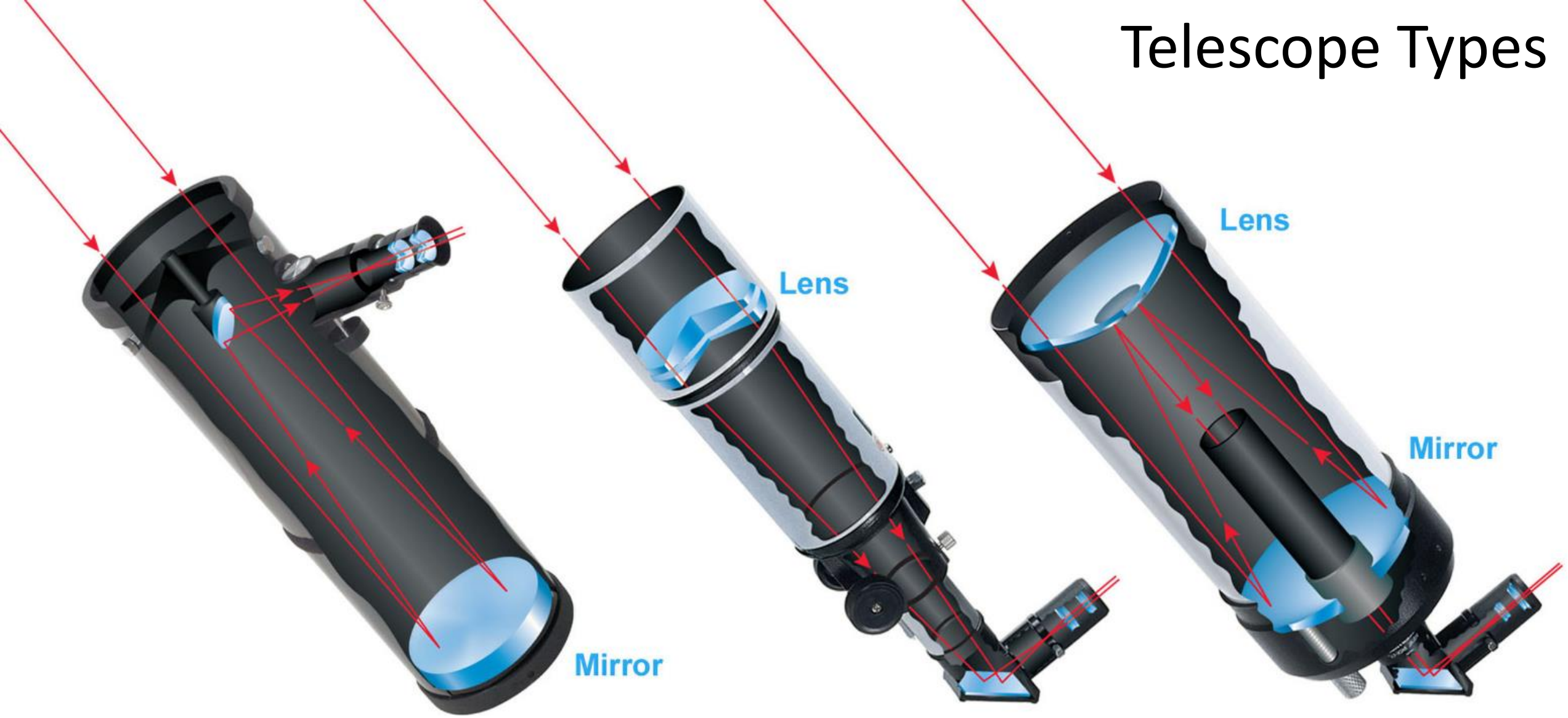
ADAS Guide to choosing the right Telescope

Produced by Members of the Society, Nov 2017

Choosing a Telescope

- **Telescope Types**
- **Telescope Features**
- **Visual or Astrophotography use ?**
- **Telescope Package or Separate Components**
- **Telescope Mounts**
- **GO-TO systems**
- **Objects of interest**

Telescope Types



Reflector

Refractor

Compound

Features

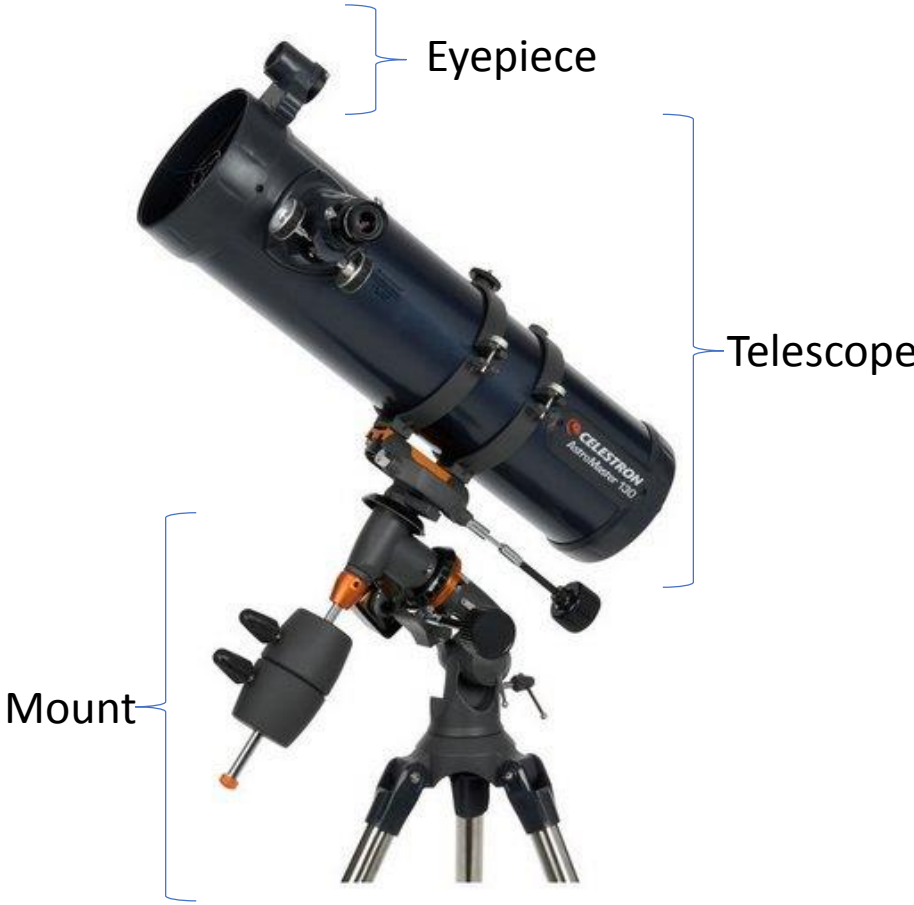
- **Aperture** refers to the diameter of the primary lens, or mirror, in a telescope. It is not only important for gathering light, but also for seeing detail. Larger apertures collect more light, which means that you can see fainter objects (such as galaxies) or smaller features that are on a solid body (such as craters on the moon).
- **Focal length** refers to the distance between the primary lens/mirror and the point where the object is brought into focus. The focal length is important, because it's a factor in how well a telescope magnifies objects. To figure out the magnification, divide the focal length of the telescope by the focal length of the eyepiece: If you have a 25-millimeter eyepiece and a refractor of 900 mm, the magnification is 36 power, written as 36x (or, 900 / 25 = 36). To avoid fuzziness, make sure to magnify a telescope to no more than twice the aperture of your telescope in millimeters (or 50 times the aperture in inches).
- A **finder** is an observing aid that sits on the telescope. It's good to have one, because it makes it easier for you to find objects in the sky; looking through the telescope itself can be difficult at high magnifications. Many telescopes these days use "red dot" finders, which project a red dot, or centering pattern, on the sky without magnifying the view.

Visual or Astrophotography use ?

- **Visual** refers to adding an eyepiece to the end of the telescope and looking through it with your eye.
- **Astrophotography** refers to attaching a camera to the end of the telescope instead of an eyepiece.
- When in visual mode, your brain only lets you accumulate ~ 3 seconds of an image before processing. So in this mode, Aperture is all important.
- In Astrophotography mode, you can extend the exposure time to minutes or even hours (only limited by how long you can hold the object still in the image). So Aperture is not so important as the quality of the tripod and its tracking capabilities.

Telescope Package or separate components ?

- **A telescope package** refers to a complete astronomical solution including the telescope, eyepieces(s) and mount
- Alternatively you can buy each of these individually to build your own custom solution using **separate components**.
- It may appear that buying a telescope package is the best cost effective solution but only if all components are what you wanted.
- The advantage of buying separate components is you will get a solution that fits your own requirements. If selected wisely then nothing is wasted.



Telescope Mounts

- **A Telescope mount** is what the telescope sits and is made up of 2 parts:
  - Head
  - Base
- **HEAD** can be as simple as a bracket but if a GO-TO system is employed will include motors to move the telescope in 2 axis. For such systems, the HEAD can be operate in one of two ways - Equatorial or Alt-Azimuth

  Equatorial heads are tilted at the angle of the user's latitude to allow the movement to follow the astronomical object by only having to move in one axis.

  Alt-Azimuth heads are simpler (cheaper) to setup and have horizontal (ALT) and vertical (AZIMUTH) axis and so to follow the astronomical object – movement of both axis is required.

Telescope Mounts (continued)

- **BASE** can either be one of two types - tripod or a pillar.

  Tripod is the most common base for a telescope but comes in many levels of size and quality. In its simplest form it's a small tripod that can sit on a table. But this can only carry a small telescope setup. At the other extreme heavy tripods can weight up to t 10kgs themselves but can then carry the weight of a telescope system up to 50kgs. In all cases the advantage of the tripod is it's a portable solution.

  Pillar is the preference for a permanent housing of a telescope. Its essentially a cylinder of concrete and metal that can be bolted to the ground and has a bracket to hold the telescope Head.

Go To Systems

- **A GO-TO system** is a telescope mount that includes a computer, motors to move the telescope in 2 axis, a database of the position of 1000's of known objects and a handset to control it.
- **GO-TO systems** can be purchased as part of a telescope package or else as a separate telescope mount component.
- The benefit or promise of a **GO-TO system** is the ability to pick an object on the handset and see the telescope magically move to that object, centring the object in the eyepiece or in the camera frame.
- In practice this will only work well if the telescope system has been successfully "aligned" first. Getting the telescope system to be aligned can be complex and time consuming and will probably need to happen each time you use it.

Objects of interest

- **Class A - Bright objects :** these are limited to the brightest stars and star clusters, the Moon, the planets Jupiter and Saturn and to a lesser degree the planet Mars
- **Class B - Fainter objects :** these are most of the stars and star clusters, the brightest nebula and some galaxies.
- **Class C – faint objects :** these tend to be the fainter galaxies and nebula

- Class A objects generally need large magnification of at least 150 times (this means a large focal length but not necessarily a large Aperture).
- Class B objects are generally larger and don't need large magnification i.e. < 100 times but can benefit from a larger aperture.
- Class C objects are generally small and faint and need large magnification i.e. > 150 times and larger apertures.

Examples

1. **I just want to look at planets and the moon for few minutes at a time**
   - Don't bother with a telescope. Use Binoculars 15 x 70 or 20 x 50 will do fine.
2. **I just want to look at planets and the moon**
   - Buy a cheaper telescope with a Focal Length of at least 1500 on a tripod (no go-to needed)
3. **I want to look at galaxies and nebula**
   - Need a 4" refractor or 8" reflector telescope with a Focal Length of at least 1000 on a tripod with a go-to system
4. **I want to take pictures of planets and the moon**
   - Need a telescope with a Focal Length of at least 1000 on sturdy tripod with a go-to system. Use a webcam to take the pictures.
5. **I want to take pictures of bright galaxies and nebula**
   - Need a telescope on sturdy tripod with a go-to system. Use a DSLR or CCD camera to take the pictures.
6. **I want to take pictures of fainter galaxies and nebula**
   - Need a telescope on sturdy tripod with a go-to system. Need a supporting tracking system to extend the exposure times. Use a DSLR or CCD camera to take the pictures.