

First Eye on the Sky



| First Eye on the Sky | |
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| Introduction | Buying your first telescope |
| Types of Telescope | How do they differ? |
| Telescope Mounts | Alt-Az? Equatorial? |
| Pros and Cons | Why is one better than another? |
| Prices | A rough guide |
| Hints and Tips | A few things to consider before handing over your cash |

Beginners' Guides

There's lots of help out there.

There are some well-written beginners' guides available on the web...

... but remember that if they are sponsored by a telescope manufacturer, then they are the only make of telescopes that you will find inside.

Beginners' Guides

All about refractors

What light is refracted, the word "refract" means "to bend". Refracting telescopes (usually called "refractors") use lenses to bend light and focus it on your eye. The light enters the front of the telescope, passes through a series of lenses, and is focused to form an image. Refractors are often called "lens" telescopes.

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All about reflectors

Reflectors use a system of mirrors to gather light. The light enters the front of the telescope, hits a primary mirror at the back, and is reflected back to a secondary mirror. The light then travels back out through the front of the telescope. Reflectors are often called "mirror" telescopes.

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Confused? That's Not Surprising

This slide displays a collage of six pages from a detailed telescope buying guide. The pages are organized into two rows of three. Each page features images of different telescope types (Newtonian reflectors, Dobsonian reflectors, and catadioptrics) along with technical specifications, diagrams, and text explaining their features and uses. The layout is designed to help potential buyers navigate the various options available in the market.

Telescope Types

This diagram illustrates the classification of telescopes based on their optical design. It features three overlapping circles. The left circle is labeled 'Dioptrics (lenses)' and contains an image of a refractor telescope. The right circle is labeled 'Catoptrics (mirrors)' and contains an image of a reflector telescope. The central overlapping area is labeled 'Catadioptrics (elements of both)' and contains an image of a catadioptric telescope. The University of Liverpool logo is visible in the bottom left corner.

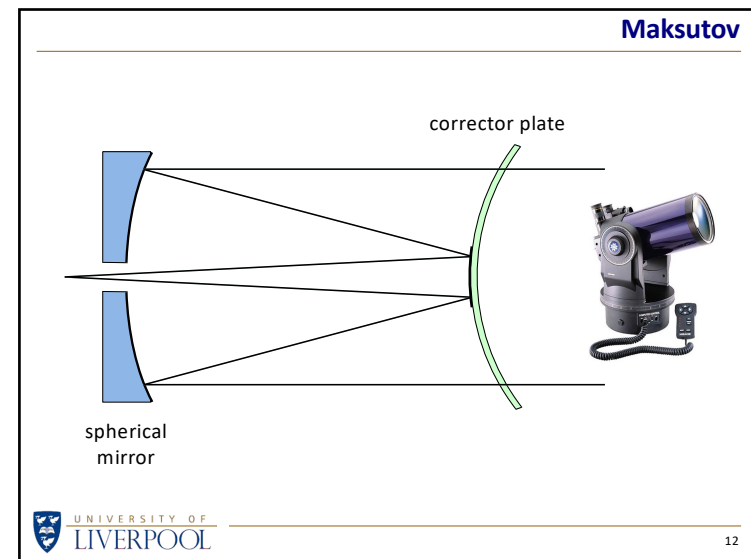
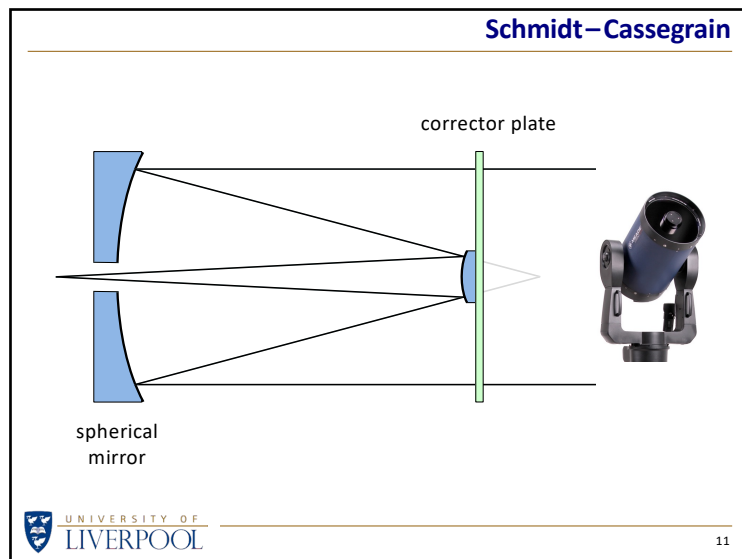
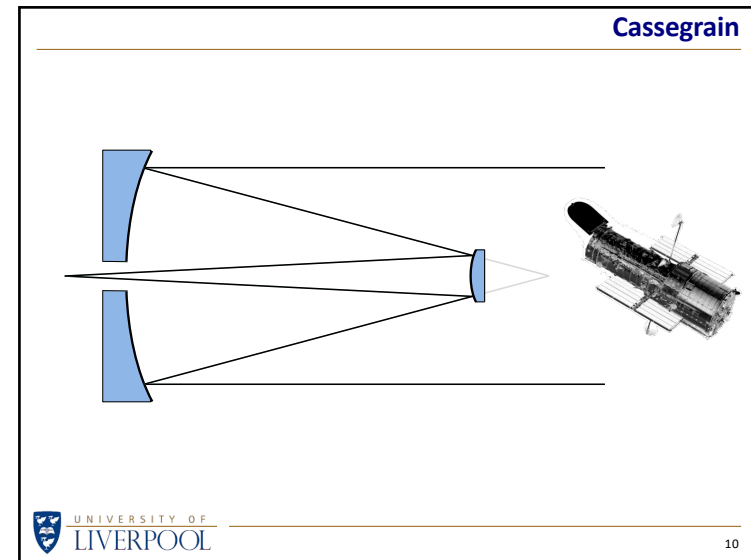
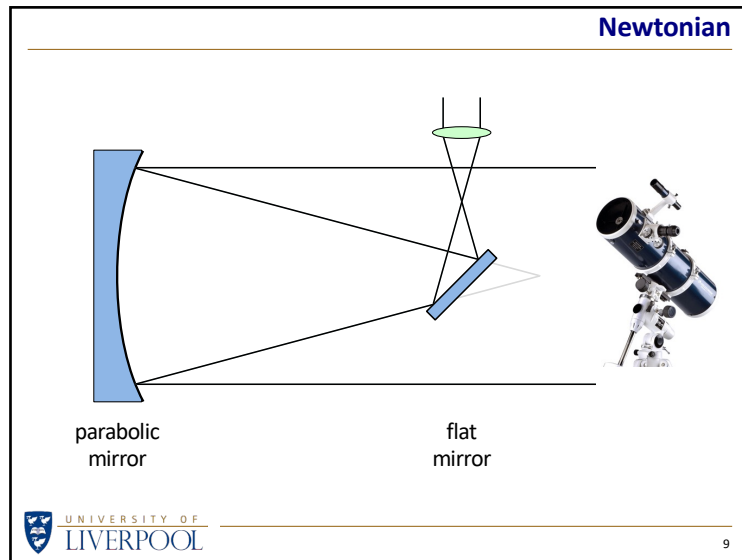
Telescope Types

This diagram illustrates the classification of telescopes based on their optical design. It features three overlapping circles. The left circle is labeled 'Refractors' and contains an image of a refractor telescope. The right circle is labeled 'Reflectors' and contains an image of a reflector telescope. The central overlapping area is labeled '"Cats"' and contains an image of a catadioptric telescope. The University of Liverpool logo is visible in the bottom left corner.

Refractor

This diagram shows a refractor telescope and a cross-sectional view of its internal optics. The telescope is shown on the left, with its objective lens at the front and eyepiece at the back. The cross-section on the right shows light rays entering from the left, passing through the objective lens, and converging at a focal point. The eyepiece is shown as a small lens at the back. The objective lens is labeled 'objective lens' and the eyepiece is labeled 'eyepiece'. The text 'comprising multiple lens elements' is written below the objective lens. The University of Liverpool logo is visible in the bottom left corner.

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Telescope Mounts – Alt-Az



The simplest mounts allow movement in **altitude** (up-down) and **azimuth** (left-right).



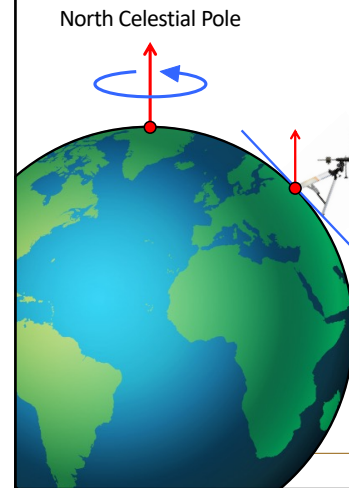
Some alt-az mounts are motorised and can be controlled by your smart phone.



The more it can do, the more you pay.



Telescope Mounts – Equatorial



Why use a mount with axes at such jaunty angles?

Aligning the mount parallel with the Earth's axis means that driving only **one** axis is enough to follow the stars.

Astrophotography

Small "eyepiece cameras" can be used on any telescope.

Telescopes with long focal lengths can provide good images of the **Moon** and the brighter **planets**.



For fainter **deep sky objects**, like nebulae and galaxies, long exposures require that the telescope is on a motor-driven **equatorial** mount.



Serious astrophotographers either buy dedicated astro cameras (left) or use their digital SLR cameras (right).



(The pros and cons of different cameras will be deferred to a future workshop)

Astrophotography

Aside: Remember that astrophotography doesn't **need** a telescope, as you can use a camera on a star tracker:



Astrophotography using a telescope can be very rewarding, but to get the most out of it will take quite a bit of time, effort and cash.

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Pros and Cons

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

Lenses suffer from chromatic aberration (colour fringing)

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Pros and Cons

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

Mirrors get around that problem

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Pros and Cons

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

Dob = Newtonian on simple alt-az mount

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Pros and Cons

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

Long focal lengths in compact tubes

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Pros and Cons

Large apertures good for deep sky objects

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

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Pros and Cons

Largest aperture for a given price

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

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Pros and Cons

Sealed optics mean low maintenance

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

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Pros and Cons

Portable or easily transportable

Maksutov

Newtonian

Refractor

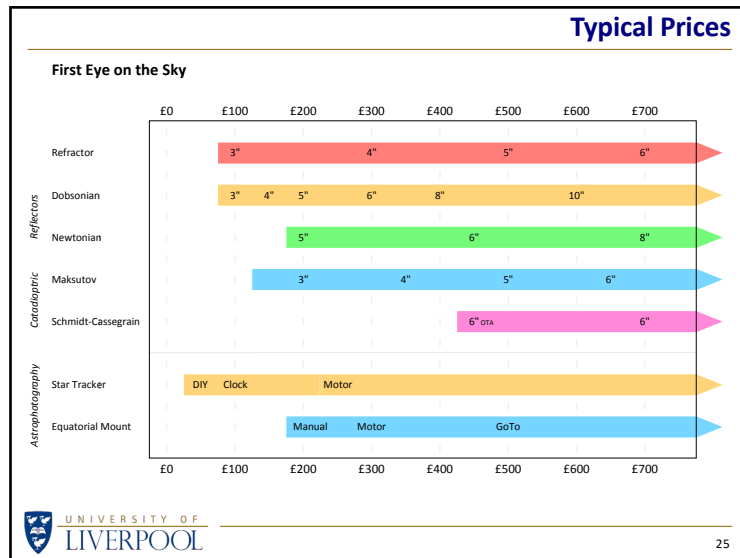
Schmidt-Cassegrain

Dobsonian

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Hints and Tips

You can't go far wrong with any of the "big five" manufacturers










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Hints and Tips


Aperture vs Focal Length

Of the two, aperture is more important. Aperture determines how much light is 'caught' by the telescope and the detail in the image. Focal length determines the magnification of a given eyepiece.



Magnification

Your telescope will come with one or two eyepieces that provide you with appropriate magnification. Later, you can think about whether you want more/different eyepieces.



High magnification is less important than you think.


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Hints and Tips


Ergonomics

Think about where you will be using the telescope. Will you be carrying it in/out of the house? Does it sit on a tripod or on a table? Will you be taking it to a dark sky site? Does it have to be portable or transportable?



Astrophotography

Visual astronomy and astrophotography have different requirements. The precision with which the telescope tracks the motion of the stars is not critical for you to enjoy the view of Saturn, but it is if you want to take long-exposure images.



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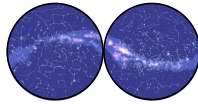
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Hints and Tips

GoTo Telescopes

Do you want to get to know your way around the night sky? Manually operated telescopes encourage you to learn the sky. GoTo telescopes can make you a "back-seat driver".



Try Before You Buy

The best way to get a feel for the different types of telescope is to try out a few on an observing evening. View the same object through a variety of telescopes and see what you think.



Buying Secondhand

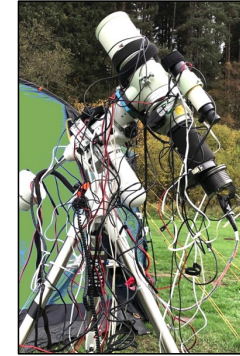
It's a good idea to take advice from other society members on what you think might be an 'internet bargain'.



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Hints and Tips

Try to avoid the urge to keep adding accessories...



Jonathan Egoff @Photohorizons

...until you run out of cables.



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Hints and Tips

Images of telescopes can be misleading if displayed side by side...



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Hints and Tips

... unless they are shown to scale.

For you, what is a comfortable viewing height?




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Hints and Tips

Larger apertures are (generally) better
but remember that large means **heavy**.



2 kg 24 kg

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Hints and Tips

Read the spec.

Make sure you know what you are getting before it is delivered to avoid surprises ...

... and yes, the Meade RCX 20" really is **that** big.




300 kg

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Final Thoughts

- Your options are many and varied
- This is good ... and bad ... and confusing
- Don't suffer from "analysis paralysis"
 - Look at what you can afford
 - Take advice
 - Make a decision
 - Enjoy your stargazing
- Make full use of the resources of your astronomical society – the members
- The best telescope? The one you **use**.



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A Rough Guide

to buying your first astronomical telescope

www.liverpool.ac.uk/~sdb/Talks

Dr Steve Barrett
BASoc 1 Nov 2021

