

# First Eye on the Sky



First Eye on the Sky	
<b>Introduction</b>	Buying your first telescope
<b>Types of Telescope</b>	How do they differ?
<b>Telescope Mounts</b>	Alt-Az? Equatorial?
<b>Pros and Cons</b>	Why is one better than another?
<b>Prices</b>	A rough guide
<b>Hints and Tips</b>	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". A refracting telescope (usually called a "refractor") uses lenses to bend light so that it comes to a focus. The light then enters the eyepiece and is focused on the retina of your eye. The light then enters the eyepiece and is focused on the retina of your eye. The light then enters the eyepiece and is focused on the retina of your eye.

3 THINGS YOU SHOULD KNOW

- Refractors use a lens system to collect light.
- Refractors are usually easier to use than reflectors.
- Refractors are usually more expensive than reflectors.

#### All about reflectors

Reflectors use a system of mirrors to collect light. The light enters the telescope and is reflected by a primary mirror at the back of the telescope. The light then enters the eyepiece and is focused on the retina of your eye. The light then enters the eyepiece and is focused on the retina of your eye. The light then enters the eyepiece and is focused on the retina of your eye.

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## Confused? That's Not Surprising

This slide contains six small diagrams arranged in a 2x3 grid. Each diagram illustrates a different type of telescope, including Newtonian reflectors, Dobsonian reflectors, and dual-speed designs. The diagrams are labeled with 'NEWTONIAN REFLECTORS' and 'DOBSONIAN REFLECTORS'.

## Telescope Types

This slide features a diagram with three overlapping circles. The left circle is labeled 'Dioptrics (lenses)', the right circle is labeled 'Catoptrics (mirrors)', and the bottom circle is labeled 'Catadioptrics (elements of both)'. Inside the circles are images of representative telescopes: a refractor in the left circle, a reflector in the right circle, and a catadioptric in the bottom circle.

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6

## Telescope Types

This slide features a diagram with three overlapping circles. The left circle is labeled 'Refractors', the right circle is labeled 'Reflectors', and the bottom circle is labeled '"Cats"'. Inside the circles are images of representative telescopes: a refractor in the left circle, a reflector in the right circle, and a catadioptric in the bottom circle.

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7

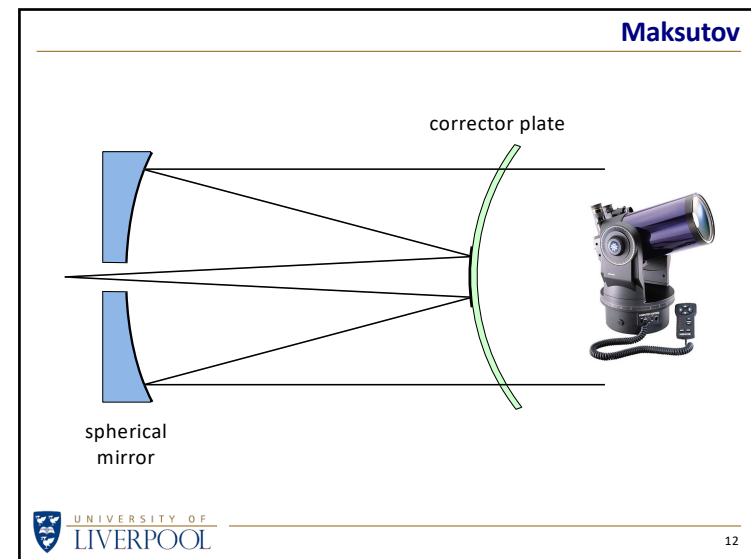
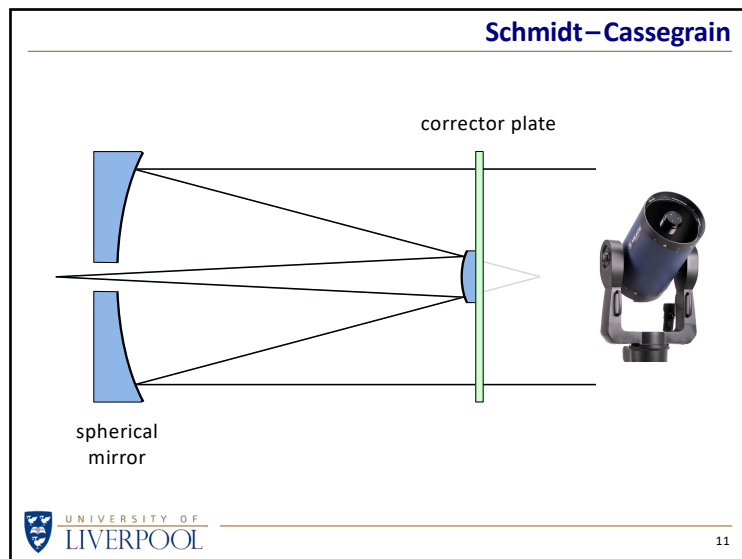
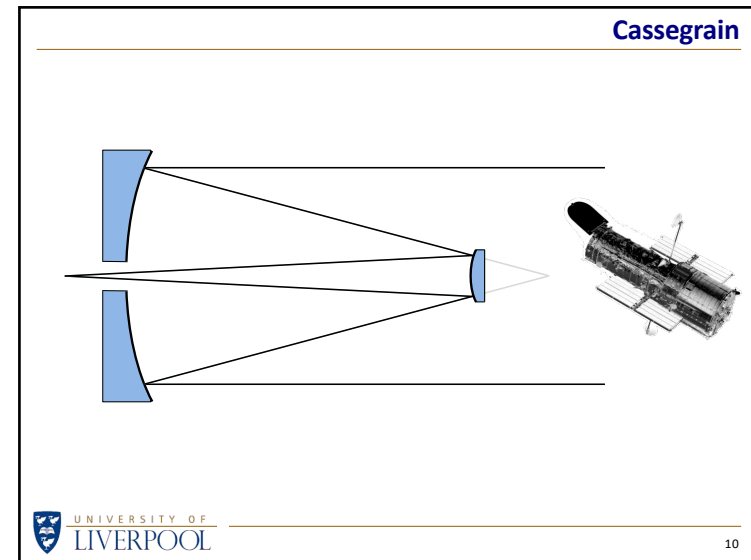
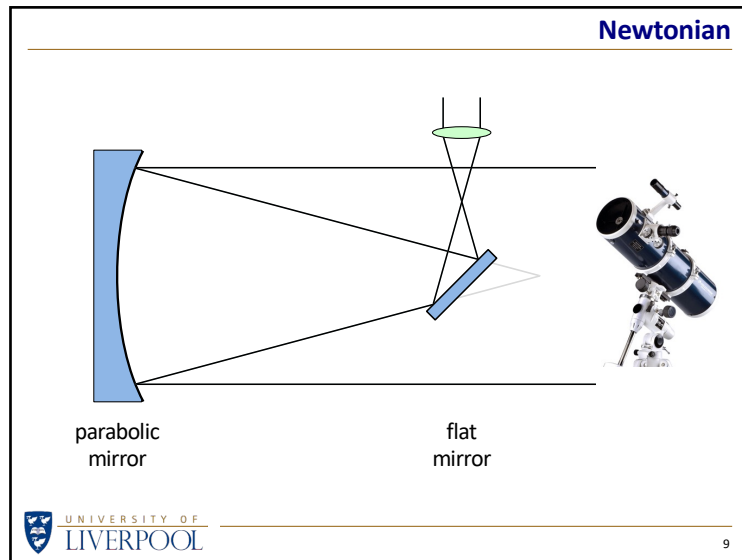
## Refractor

This slide shows a diagram of a refractor telescope. Light rays enter from the left, pass through an 'eyepiece' lens, and then through a large 'objective lens' on the right. The objective lens is labeled 'comprising multiple lens elements'.

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8

# First Eye on the Sky



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## Telescope Mounts – Alt-Az



The simplest mounts allow movement in **alt**itude (up-down) and **az**imuth (left-right).



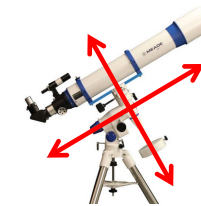
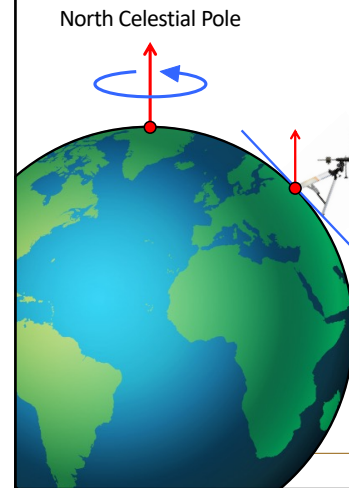
Some alt-az mounts are motorised and can be controlled by your smart phone.



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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17

**Pros and Cons**

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

Mirrors get around that problem

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18

**Pros and Cons**

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

Dob = Newtonian on simple alt-az mount

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19

**Pros and Cons**

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

Long focal lengths in compact tubes

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20

# First Eye on the Sky

**Pros and Cons**

Large apertures good for deep sky objects

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

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21

**Pros and Cons**

Largest aperture for a given price

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

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22

**Pros and Cons**

Sealed optics mean low maintenance

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

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23

**Pros and Cons**

Portable or easily transportable

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

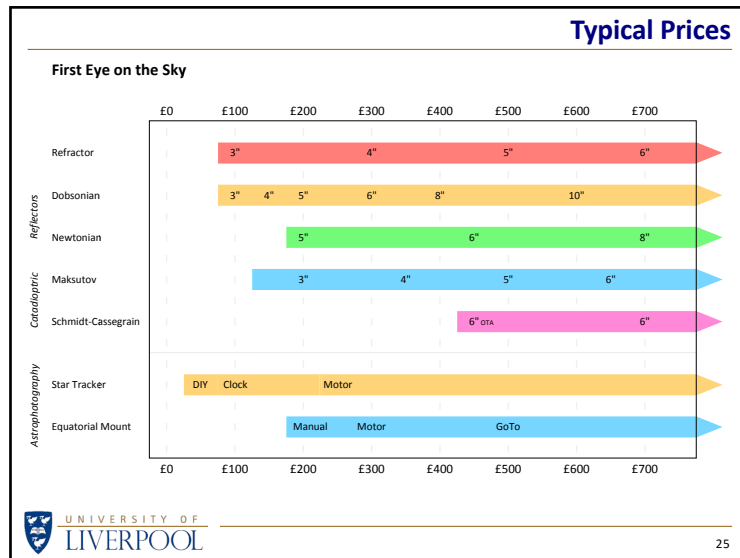
Dobsonian

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24



# First Eye on the Sky



**Hints and Tips**

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

**BRESSER**

**CELESTRON**

**MEADE**

**ORION**  
TELESOPES & BINOCULARS

**Sky-Watcher**


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26

**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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27

**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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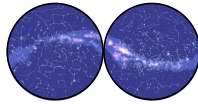
28

# First Eye on the Sky

## 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'.



29

## Hints and Tips

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



Dick Locke www.dl-digital.com



Jonathan Egoff @Photohorizons

...until you run out of cables.



30

## Hints and Tips

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



31

## Hints and Tips

... unless they are shown to scale.

For you, what is a comfortable viewing height?



32



# First Eye on the Sky

## Hints and Tips

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



## 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.



## 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**.



# First Eye on the Sky

— A Rough Guide —  
to buying your first astronomical telescope

[www.liverpool.ac.uk/~sdb/Talks](http://www.liverpool.ac.uk/~sdb/Talks)

Dr Steve Barrett  
MCAG 24 Feb 2023

