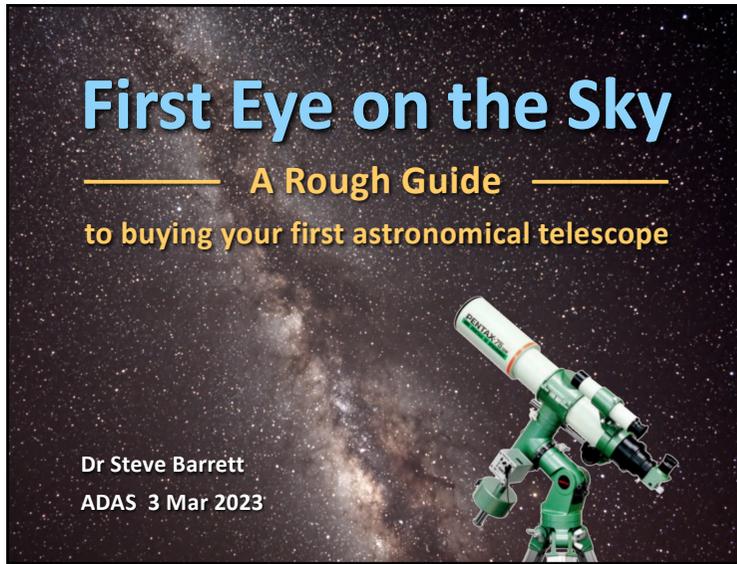


First Eye on the Sky



First Eye on the Sky

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

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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.

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Beginners' Guides

All about refractors

3 THINGS YOU SHOULD KNOW

- Refractors use a lens system to concentrate light.
- Refractors require the least maintenance of all telescopes.
- Many small refractors are light enough to mount on a tripod.

WHAT TO CONSIDER

- Aperture: The diameter of the objective lens, which makes image contrast. Greater apertures collect more light and reveal more detail.
- Resolution: The ability to see fine detail. Greater apertures collect more light and reveal more detail.
- Resolution: The ability to see fine detail. Greater apertures collect more light and reveal more detail.

All about reflectors

3 THINGS YOU SHOULD KNOW

- Reflectors use a system of mirrors to concentrate light.
- A reflecting telescope offers the best "view per dollar" rate.
- The largest amateur telescopes are reflectors.

WHAT TO CONSIDER

- Aperture: The diameter of the primary mirror, which makes image contrast. Greater apertures collect more light and reveal more detail.
- Resolution: The ability to see fine detail. Greater apertures collect more light and reveal more detail.
- Resolution: The ability to see fine detail. Greater apertures collect more light and reveal more detail.

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First Eye on the Sky

Confused? That's Not Surprising

This slide contains six small informational cards arranged in a 2x3 grid. Each card features a small image of a telescope and text describing its characteristics. The top row includes 'NEWTONIAN REFLECTORS' and 'DUAL-SPEED DESIGN NEWTONIANS'. The bottom row includes 'NEWTONIAN REFLECTORS' and 'DUAL-SPEED DESIGN NEWTONIANS'.

Telescope Types

The diagram shows 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 bottom circle, which overlaps both, is labeled 'Catadioptrics (elements of both)' and contains an image of a catadioptric telescope. The University of Liverpool logo is at the bottom left, and the number '6' is at the bottom right.

Telescope Types

The diagram shows 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 bottom circle, which overlaps both, is labeled '" Cats "' and contains an image of a catadioptric telescope. The University of Liverpool logo is at the bottom left, and the number '7' is at the bottom right.

Refractor

The diagram shows a refractor telescope on a tripod. Below it, a schematic diagram illustrates the light path. Light enters from the left, passes through an 'eyepiece' lens, converges at a focal point, and then passes through an 'objective lens' which is labeled as 'comprising multiple lens elements'. The University of Liverpool logo is at the bottom left, and the number '8' is at the bottom right.

First Eye on the Sky

Newtonian

parabolic mirror

flat mirror

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Cassegrain

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Schmidt-Cassegrain

corrector plate

spherical mirror

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Maksutov

corrector plate

spherical mirror

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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.

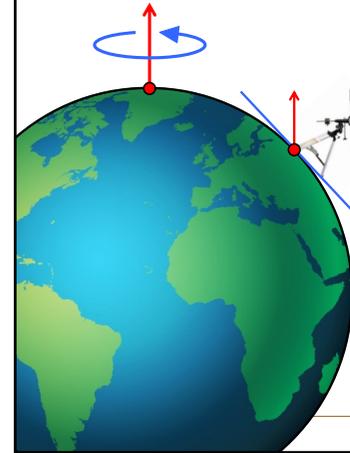


The more it can do, the more you pay.



Telescope Mounts – Equatorial

North Celestial Pole



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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First Eye on the Sky

Pros and Cons

Maksutov

Large apertures good for deep sky objects

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

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Pros and Cons

Maksutov

Newtonian

Refractor

Schmidt-Cassegrain

Largest aperture for a given price

Dobsonian

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Pros and Cons

Maksutov

Sealed optics mean low maintenance

Newtonian

Refractor

Schmidt-Cassegrain

Dobsonian

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Pros and Cons

Maksutov

Portable or easily transportable

Newtonian

Refractor

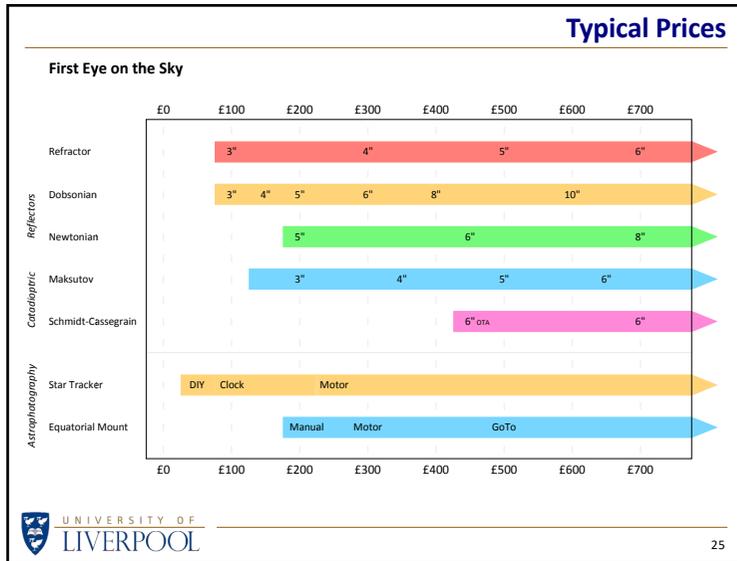
Schmidt-Cassegrain

Dobsonian

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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
TELESCOPES & BINOCULARS



Sky-Watcher

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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.

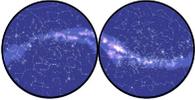


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First Eye on the Sky

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'.



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Hints and Tips

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



...until you run out of cables.



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Hints and Tips

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

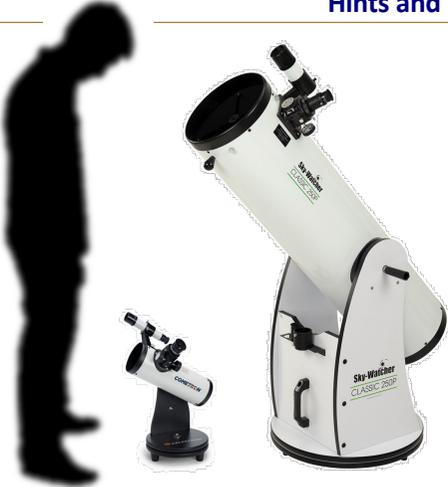


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Hints and Tips

... unless they are shown to scale.

For you, what is a comfortable viewing height?



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First Eye on the Sky

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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First Eye on the Sky

— A Rough Guide —

to buying your first astronomical telescope

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

Dr Steve Barrett
ADAS 3 Mar 2023

