



The Astronomical
Society of Edinburgh

Welcome
**CHOOSING A
TELESCOPE**

16 October 2020

WELCOME



- The Astronomical Society of Edinburgh founded in 1924
- Currently 126 members and growing
- Holding meetings twice a month online
- Members via Zoom, visitors YouTube
- Plus a very active Imaging & Observing Group (members only)
- Live streams of the night sky
- All details on our website

www.astronomyedinburgh.org

WHY ARE WE DOING THIS?

- Many new members
- Lots of questions about buying a first telescope - from non-members too
- Questions about upgrading
- So this talk is not just for beginners
- Hopefully something for everyone
- There are “Scope Talk” videos already on our YouTube channel
- We discuss kit at the Imaging & Observing Group meetings

IT IS COMPLICATED!



CHOOSING A TELESCOPE...



We'll cover:

- What type of astronomy do you want to do?
- Telescope optics
- Telescope mounts
- Binoculars
- Beginner scopes
- More advanced / separate components
- Upgradeability
- Example telescopes
- Telescope supply issues
- Used equipment



DISCLAIMER!

- Ask 5 astronomers you'll get 10 different answers!
- We don't – and won't – actually recommend any specific telescope or supplier.
- We might gently steer you away or towards something based on your ambitions and budget.
- This is based on what we have seen, purchased, used and suppliers that we've bought from in the past.
- The telescopes shown are just examples but it would be impossible for us to review all of the ones shown here.
- Do your own research. Read the reviews: Stargazers Lounge, Cloudy Nights,...
- It's always possible to buy a LEMON.
I certainly have!



SOME QUESTIONS TO CONSIDER



- What do you want to observe / concentrate on?
 - Moon & planets
 - Deep Sky Objects (DSO) - galaxies, clusters, ne
 - Or a bit of everything?
- Do you want to image?
 - Hardcore / EAA / wide angle / quick snaps
- Casual or serious observing? Grab-and-Go?
- Find objects yourself or GOTO mount?
- What's your budget?
- Portability?
- Upgradeability?
- Do you want to do real science?

EAA - Electronically Assisted Astronomy - a compromise between observing/imaging
See Part 2 of our Intro to Astro-Imaging videos



BINOCULARS



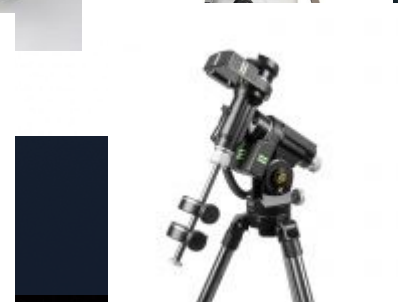
- If your budget is not large...
- Consider binoculars
- Visit a binocular shop (eg Viking Optical)
- Try some - see what works for you
- Astronomical binoculars are available
- 15x70 (£149), 20x80 (£119), 25x100 (£319)
- You'll need a tripod for larger heavy ones
- *Ordinary* binoculars work well too
- 8x40, 7x50, ...
- Wide angle views of the night sky are superb
- Helps you to find your way around and locate objects
- Useful skills for later



TELESCOPE TYPES



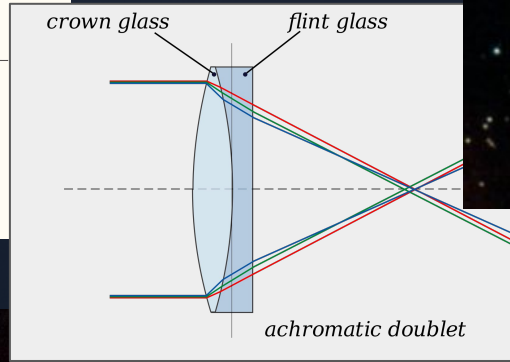
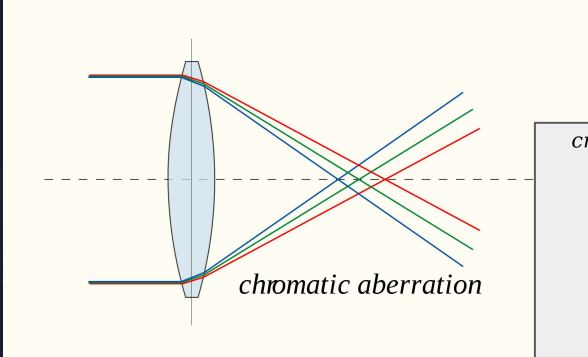
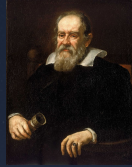
- A bit of background so you know what you're buying
- Optical Tube Assemblies (OTAs)
 - Refractors
 - Reflectors
 - Catadioptrics (Cats)
- Mounts
 - Altazimuth
 - Equatorial
 - GOTO



REFRACTORS

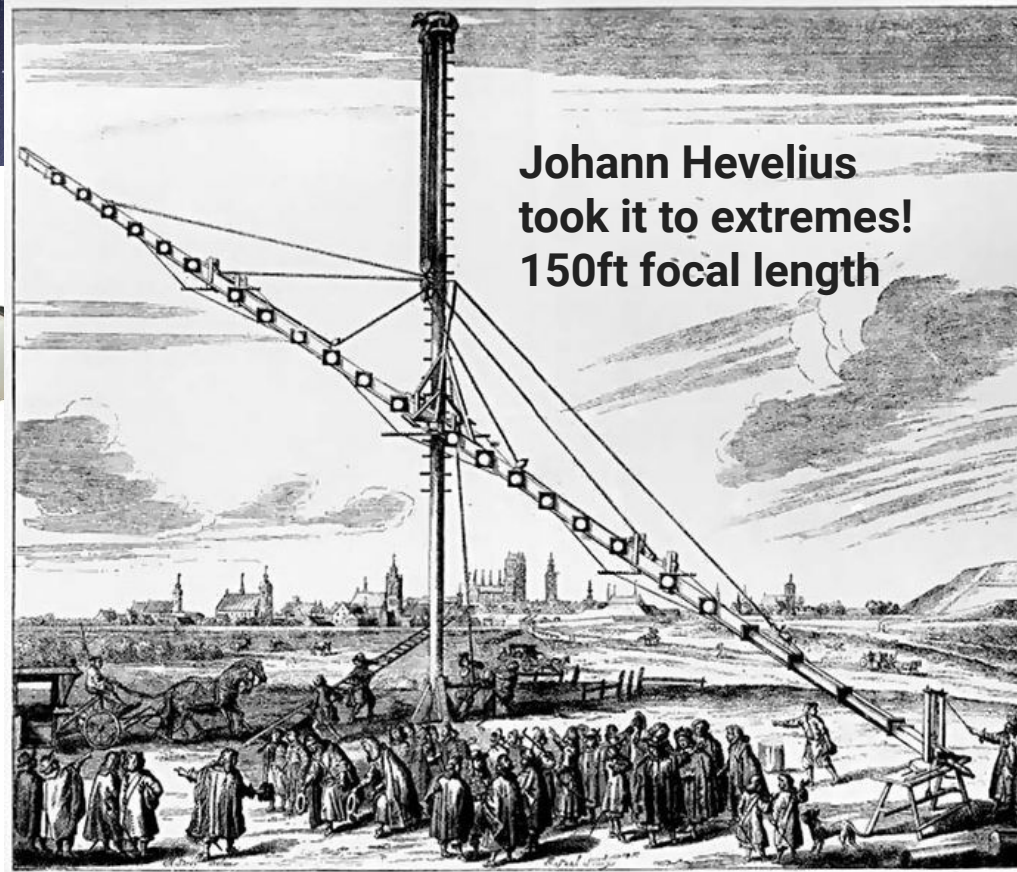


- As approved by Galileo...
- Maintenance-free
- More portable
- Achromatic - 2 lenses
- Reduces chromatic aberration



REFRACTORS

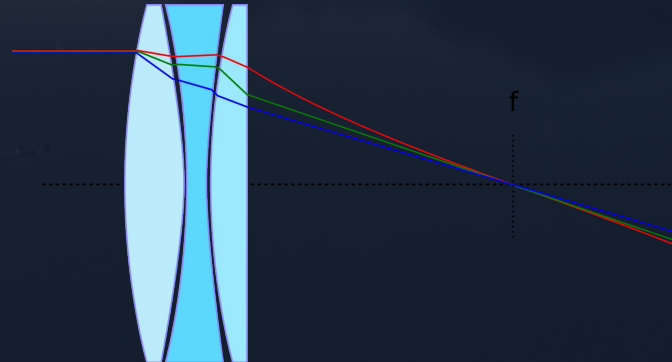
Most used to be very long focal length to reduce aberrations



ED/APO REFRACTORS



- Doublet ED refractors - “Extra-low Dispersion” (££)
- Sometimes called semi-apochromatic
- Fluorite glass
- Better colour correction
- Triplet / Quadruplet Apochromatic refractors (£££)
- Best colour correction



EXAMPLE REFRACTORS



80mm refractors from Sky-Watcher for comparison



Startravel 80 - £98
80mm / 400mm fl f4.9
Achromatic



Evostar 80ED DS Pro - £499
80mm / 600mm fl f7.5
ED Achromatic



Esprit 80ED Pro - £1120
80mm / 400mm fl f5
3 element ED apochromatic

EXAMPLE REFRACTORS



80mm refractors from Sky-Watcher for comparison



Startravel 80 - £98
80mm / 400mm fl f4.9
Achromatic



Altair Astro 80ED - £399
80mm / 560mm fl f7
ED Achromatic



Esprit 80ED Pro - £1120
80mm / 400mm fl f5
3 element ED apochromatic

WHY A REFRACTOR?



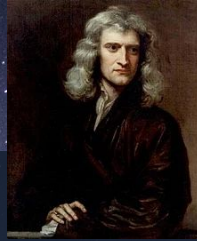
PRO

- Portable
- Maintenance-free
- Easy to use and handle
- They look like a “real telescope”
- No central obstruction - more contrast - some “exquisite views”
- Good for imaging - particularly wider field of view
- Good for casual observing
- Good grab-and-go scope
- Beginner scopes good for kids
- Longer focal length ones good for Moon, Sun and planets
- OK for DSOs

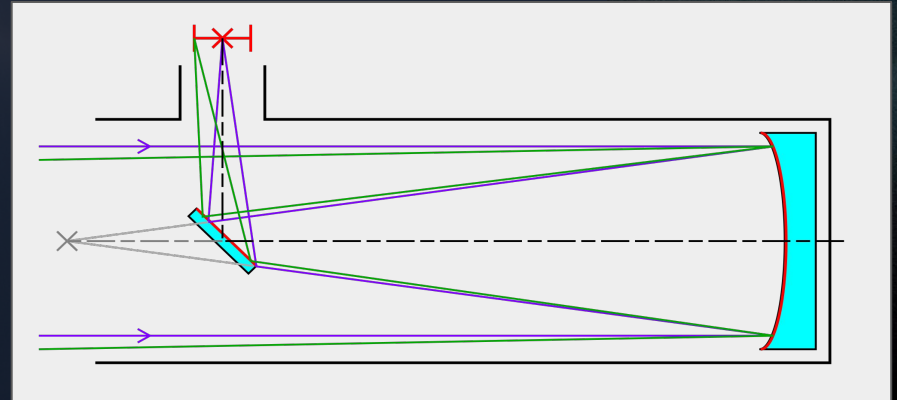
CON

- Smaller objective
- Lower light grasp
- Can be REALLY expensive
- Some colour fringing
- Colour fringing shows up more with imaging in cheaper ones
- Need a larger one for hi-res planetary
- Not so good for DSOs
- Planetary versions (f/13) can be very long

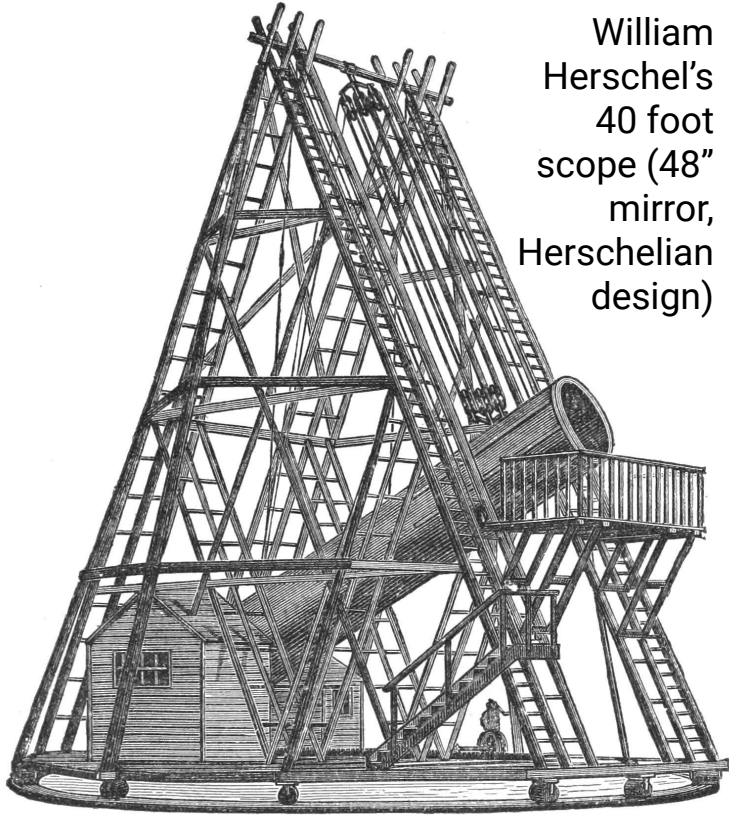
REFLECTORS



- As approved by Isaac Newton
 - Most common form is the Newtonian
 - No chromatic aberration
 - Larger objective for much less money
 - Better light gathering and resolution
-
- Some advanced versions
e.g. Ritchey-Chretien



REFLECTORS



William
Herschel's
40 foot
scope (48"
mirror,
Herschelian
design)



Lord Rosse's
Leviathan
(36" mirror)

EXAMPLE REFLECTORS



Explorer 130P - £139
130mm, 650mm fl, f5
Newtonian



Explorer 200P DS - £309
200mm, 1000mm fl, f5
Newtonian



Explorer 300P DS - £649
300mm, 1500mm fl, f4.9
Newtonian

EXAMPLE REFLECTORS



By comparison:
A large 150mm
APO refractor
costs...



Explorer 1
130mm, 650mm fl,
Newtonian



Explorer 300P DS - £649
300mm, 1500mm fl, f4.9
Newtonian

WHY A REFLECTOR?



PRO

- Relatively cheaper
- Larger objective
- Better light grasp and resolution
- Good for Moon, Sun and planets
- Great for DSOs
- Great for imaging
- No colour fringing
- Dobsonian reflectors great for beginners and kids (see later)
- Good all-round general scope

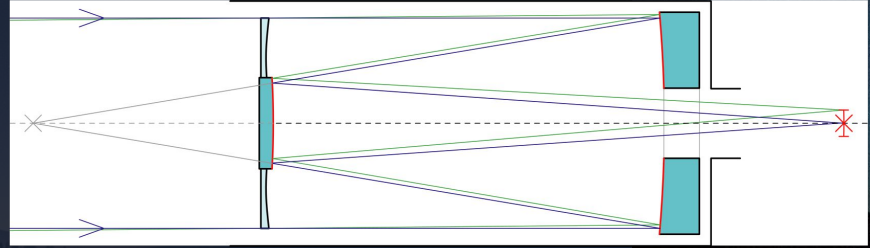
CON

- Not totally maintenance-free
- Collimation required
- Sometimes mirror needs re-aluminised (rarely)
- Central obstruction - can reduce contrast
- Bulky / heavy
- Require a larger/heavier mount
- Larger ones less portable
- Viewing position can be awkward
- Steps can be required
- Require coma correctors for imaging

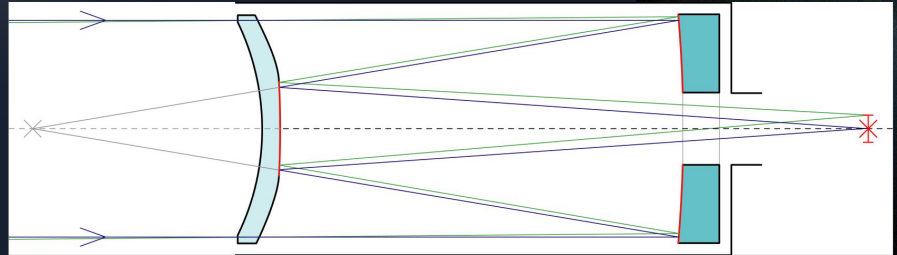
CATADIOPTRICS (CATS)



- Combination of mirrors and lenses
- Schmidt-Cassegrain (SCT)



- Maksutov-Cassegrain (Mak)



EXAMPLE CATS



Skymax 102 - £172
102mm, 1300mm fl, f12.7
Mak



Skymax 180 - £825
180mm, 2700fl, f15
"PLANET-KILLER" Mak



C5 - £495
125mm, 1250fl, f10
SCT

EXAMPLE CATS



Skymax 102 - £172
102mm, 1300mm fl, f12.7
Mak



C8 XLT - £1067
200mm, 2000fl, f10
SCT



C5 - £495
125mm, 1250fl, f10
SCT

WHY A CAT?



PRO

- Short tube length
- Convenient to handle and use
- Good observing position
- Great for Moon and planets
- The choice for serious planet imagers
- SCTs good for DSOs with optional focal reducer (f7 or f6.3)
- Often come with a GOTO mount
- Maks give fantastically sharp Moon and planet images “Planet-Killers”!
- SCTs are good all-round general scopes

CON

- More expensive than Newtonians
- ALL require a dew shield and/or dew heaters
corrector plate = dew magnet!
- Slow f-ratio not so good for DSOs
- Corrector plates need extra **cooldown time**
- Maks need *even more* **cooldown**
- Longer focal lengths are less useful for DSOs
- Focusing mechanism can cause mirror/image shift at high mag.

MOUNTS

- Get a good mount!
- Can upgrade/use other OTAs
- If it wobbles when you breathe on it - NO FUN
- For imaging spend more on the mount than scope
- GOTO is useful, helps in light polluted areas
- Simple mounts can be the most fun
- Complex mounts are fun too - more advanced
- Look at the mount weight - if you can't carry it you won't use it (or hurt yourself)
- Take note of the load capacity
- Underload - not overload - for imaging

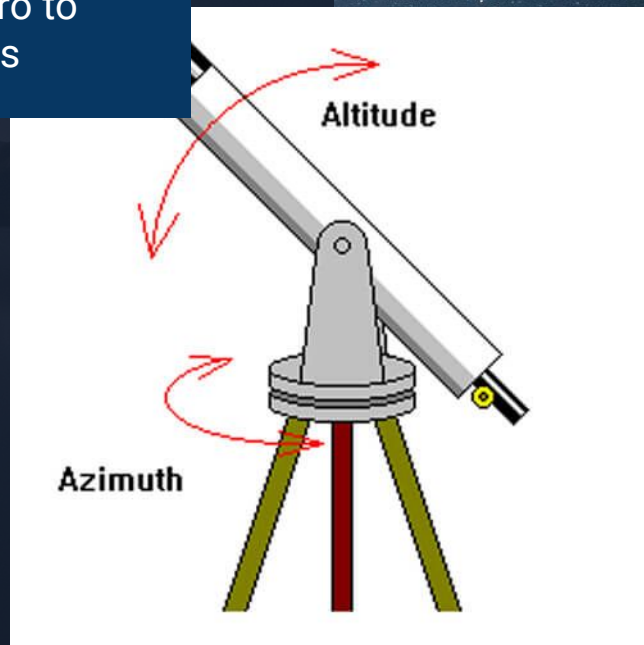


ALTAZIMUTH MOUNTS



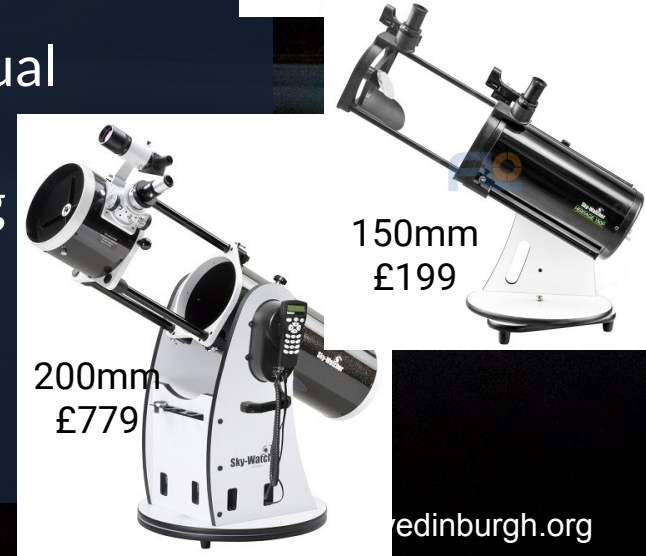
- Up/Down - Left/Right
- Simple to use and setup
- Easy to grab-and-go
- Often lightweight
- Cheaper than EQ
- Can be Goto mounts
- Can track and be used for shorter exposure imaging and EAA
- Longer exposures get field rotation
- Good enough for most purposes

EAA - Electronically Assisted Astronomy - a compromise between observing/imaging
See Part 2 of our Intro to Astro-Imaging videos



DOBSONIAN MOUNT

- A specific type of altazimuth mount
- Very easy to use - just push it!
- Great for observing DSO
- Easy for children and beginners
- Some need a solid table
- Hard to do better as a beginner scope for casual observing
- Also a serious instrument for visual observing
- More complex goto versions available



DOBSONIAN MOUNT

- A specific type of altazimuth mount
- Very easy to use - just push it!



0.5m mirror

£4,999



200mm
£289



100mm
£98

inner scope for casual

for visual observing
ns available



200mm
£779



150mm
£199

EXAMPLE ALT AZ MOUNTS



Az Pronto - £125
Manual slow motions
Payload capacity 3kg



Az GTi - £215
Smartphone App
Controlled
Payload 5kg



Rowan Heavy Duty
Computer controlled
£795-£1490
Payload 15/20kg
each side

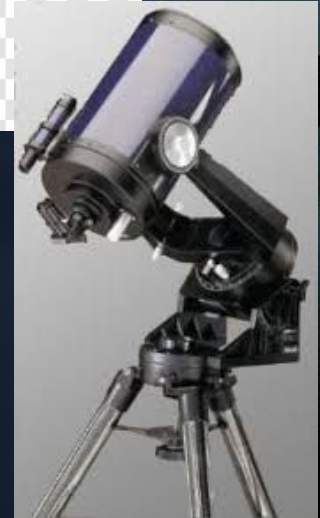
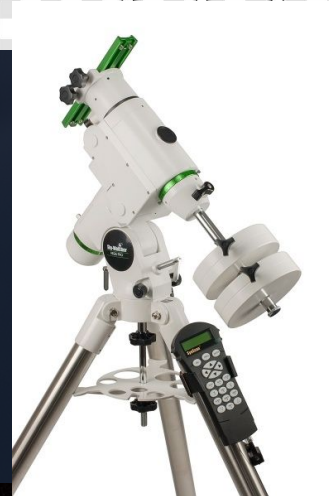
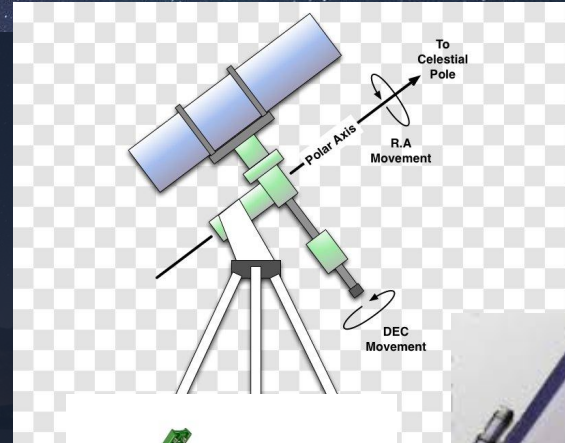


Many CATs come with
single arm altaz mounts

EQUATORIAL MOUNTS

- Aligned with the pole
- Tracks stars in one axis
- Best for hardcore/long exposure imaging
- More complex to use
- Heavier
- More future-proof if your interests change
- More expensive
- Two main types:
 - German (GEM)
 - Fork

(I won't be addressing high-end mounts)



EXAMPLE EQ MOUNTS



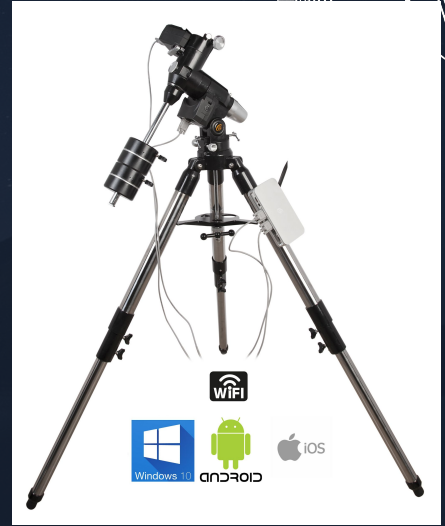
HEQ5 Pro Goto
£789 very popular
Capacity 11/15kg



EQ6-R Pro Goto
£1229 (mine)
Capacity 20kg
(imaging)



iOptron CEM40 £2199
built in guider
Capacity 18kg



Explore Scientific
EXOS-2 PMC-Eight
£699
Capacity 12.7/18kg
Wireless control

BEGINNER SCOPES



- Come as a kit - with eyepieces and finder
- Easy way to get started
- Some are easy to use
- Good for beginners, fun for children
- Portable
- Quality is variable
- Usually not upgradeable
- Can be junk and put you off astronomy

The “Hobby Killer”

- If you get serious you need to replace it
- See the post on our website

<https://www.astronomyedinburgh.org/2019/11/13/buying-a-telescope-for-christmas/>

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- Come as a kit – with eyepieces and finder
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The “Hobby Killer”

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- See the post on our website

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“the best telescope for the money spent on a child”
If it came from a toy shop - it’s probably a toy!

EXAMPLE BEGINNER "KITS"



£98



£79



£145



£195



£289



Smartphone not included

- For more see the post on our website
<https://www.astronomyedinburgh.org/2019/11/13/buying-a-telescope-for-christmas/>

LUNAR/PLANETARY/SOLAR



- Slower scopes: f8 - f15
- Longer focal lengths, smaller field of view (FOV)
- Maks, SCTs, long focus refractors
- Altaz is fine - motor drive very useful (essential?)
- EQs also good
- Higher magnification required -
Steady mount!

Speed: FAST / SLOW

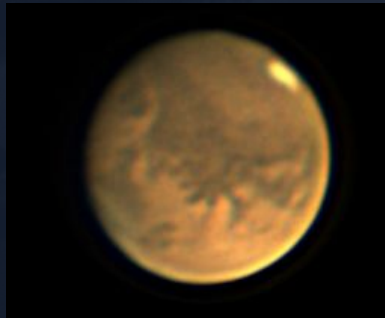
F-ratio = focal length / objective diameter

8 inch Newtonian

$1000\text{mm}/200\text{mm} = f5 = \text{FAST}$

8 inch SCT

$2000/200\text{mm} = f10 = \text{SLOW}$



DEEP SKY OBJECTS



- Faster scopes: f4 - f7
- Shorter focal lengths, wider FOV
- Newtonians, short focus refractors, SCT with reducer
- Altaz is fine for observing and EAA
- EQs also good, solid required for long exposures
- Lower magnification



ALL ROUNDERS



- Is there such a thing as an “all-round scope”?
- NO / YES / MAYBE...
- The best kit is specified for the object
- But there are some good all-rounders
- 150-250mm f5 Newtonian - good for DSO, Moon, Sun and planets with a Barlow
- 6-8 inch SCT - fine for DSO with a reducer (f7, f6.3), good for Moon, Sun, planets
- 80-120mm ED/APO refractor - portable, good balance between size/cost/performance
- Only guided EQ mounts will do long exposure DSO

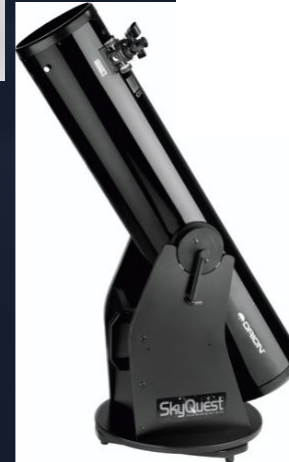
DECENT SETUPS?



WiFi



STARWAVE™
ASCENT 80 ED



HARDCORE IMAGING

- Not the easiest, but often people aim for
- Driven EQ mount
- OTA
- Camera + adapters
- Guidscope and guidecam
 - or off axis guider and guidecam
- Laptop and interface cables (ASlair?)
- Capture software (free and £)
- Processing software (free and £)
- Can be done relatively cheaply if you know how
- See our **Intro to Astro-imaging Videos**



STOCK LEVELS....



- ...are **LOW!**
- Due to COVID-19
- Shipments from China are very delayed
- Most telescopes showing long lead times
- Don't believe the actual timescales
- Suppliers cannot guarantee when they will arrive
- Some suppliers "may" have old stock
- All Skywatcher (+ others) products are imported via same companies
- If one supplier hasn't got it then it's likely the others haven't either
- Consider 2nd hand?



Used Equipment - Buyer Beware!



- Used equipment is an alternative
- It's in stock - until it's bought
- It should be cheaper - consider whether the price difference is worth the risk of no guarantee
- Check every detail and picture in the advert
- Research the seller, try Googling their name and email address
- Check all the feedback - some of which may be fake
- Consider the tone of any reply the seller has given to complaints
- Follow the standard payment safeguards

Used Equipment - Case Study



- NEQ6 mount, New ~£1,000 - bought on Ebay, £500
- Skywatcher 200P, New ~£260, - bought on Ebay, £110
- Altair GPCAM, New ~£150, - bought from FLO, £100
- Guide Scope New ~£150, - bought on Ebay, £75
- First astro modified DSLR - bought on Ebay for £84 - always determine the shutter count before buying
- Second DSLR - bought from Wex for £160 - Canon 100D - included 1 year guarantee - like new - 800 shutter count

But Buyer Beware!

Some Used Equipment Sites



- <https://www.astrobuysell.com/uk/propview.php>
- <https://stargazerslounge.com/forum/217-for-sale-swap>
- <https://www.wexphotovideo.com/used> - sold with a guarantee
- <https://www.ebay.co.uk>
- <https://www.gumtree.com> - a bit of a wild card
- Astroboot - cheap bits and pieces
<https://www.astroboot.co.uk/AstroBoot>
- Facebook: Astronomy Scotland sometimes have local sales
- The ASE sometimes get offered kit for sale (or free!)
- Some suppliers have clearance offers

Buyer Beware!



The Astronomical
Society of Edinburgh

NEXT STEP?

**Join us and our Imaging & Observing
Group for more discussion!**

ASE membership only £15 / £30 per year

www.astronomyedinburgh.org/membership