



NORTH ESSEX
ASTRONOMICAL
SOCIETY

Choosing Your First Telescope



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Don't Panic!

Choosing your first telescope can seem a bit scary at first. There are so many to pick from and lots of confusing technical jargon. If your head is spinning, this short guide from North Essex Astronomical Society will help you make the right decision.

A Few Questions About You First...

When looking for a telescope, there are a few simple questions that will help you narrow down the choices quickly. Tick any of the boxes that apply in each section below, and then use your answers along with our telescope guide.

Approximately how much do you want to spend?

£40-£200 	£200-£500 	£500+ 
<input checked="" type="checkbox"/>		

We suggest you don't spend too much on your first telescope unless you are absolutely sure this is the hobby for you. A good quality telescope can be sold second-hand when you upgrade

Who is the telescope for?

Family 	Teenager 	Adult 
<input checked="" type="checkbox"/>		

Up to the age of about 14, mum or dad will be setting up and working the telescope. Younger teenagers will soon want something sturdy that they can set up and use without help, whilst advanced or expensive kit is best left to adults.

How large a telescope can you manage?

Small/Light 	Portable 	Big and/or Heavy 
<input checked="" type="checkbox"/>		

Will you just use the telescope in your back garden or does it need to be portable enough to take it out in your car to darker locations? Also think about where you will store it and how much weight you are able to move around on your own.

How comfortable are you with technology?

Tech-Savvy 	Technophobe 
<input checked="" type="checkbox"/>	

If you're a whizz with the latest gadgets and smartphones, a computerised "GOTO" telescope might be for you. If you struggle with the microwave, a manual telescope is a better choice.

What do you want to view most?

Moon / Planets 	Galaxies / Nebulas 	Star Fields / Clusters 
<input checked="" type="checkbox"/>		

Some telescopes are better for viewing certain types of objects, whereas others work as 'all rounders'. Don't worry too much as you can see a lot with any telescope.

Types of Telescope

There are three main types of telescope available for purchase. Each has its advantages and disadvantages. As with anything in life, you get what you pay for and price is (usually) a fair guide to the capability and quality of a telescope.

Refractors

The refractor is most people's idea of a 'real' telescope, especially children. It consists of a glass lens at one end of the telescope and the focuser and eyepiece at the other.



Advantages	Disadvantages
<i>Small aperture refractors are compact, lightweight, easy to store and transport.</i>	<i>Larger aperture refractors are heavy, and often long and unwieldy.</i>
<i>Maintenance free and will work straight out of the box.</i>	<i>High quality ("Doublet", "Triplet", "Apo") refractors are very expensive.</i>
<i>Come in a variety of focal lengths suited to either wide starfield viewing or Moon/planet viewing.</i>	<i>Cheaper ("Achromatic") refractors will show coloured 'rainbow' fringes around bright stars, planets and the moon.</i>

Reflectors

The reflector consists of a large curved mirror at the bottom of the telescope and a small flat mirror at the top which reflects the light out of the side through the focuser and eyepiece.



Advantages	Disadvantages
<i>Best 'bang for your buck' as reflectors are cheaper than the other types at all apertures.</i>	<i>Large reflectors may be lighter than other big telescopes but quickly become unwieldy.</i>
<i>Much larger apertures available than for refractors, and lighter than catadioptrics.</i>	<i>Need to be "collimated" from time to time to align the mirrors by tweaking a few screws.</i>
<i>Reflectors don't suffer from 'rainbow' colour fringes</i>	<i>Larger size/weight needs a better mount to prevent the view wobbling about.</i>

Catadioptric

The catadioptric is a special type of reflector. It consists of a large curved mirror at the bottom of the telescope and a glass ‘corrector’ at the top with a spherical mirror set in to it. The light leaves the bottom of telescope through a hole in the main mirror and in to the eyepiece. There are two types in common use, the Maksutov Cassegrain (‘Mak’, usually smaller, **left**) and the Schmidt Cassegrain (‘SCT’, usually larger, **right**).



Advantages	Disadvantages
<i>Long focal length packed in to a short telescope tube. Great for Moon/planet viewing, double stars and small objects.</i>	<i>Small field of view can make it hard for the beginner to find things. Much more expensive than the equivalent aperture reflector.</i>
<i>Small Maks are very compact, portable and practical to use. They do not need collimation.</i>	<i>Large aperture SCTs are big and heavy, and must be collimated from time to time .</i>
<i>SCTs are much more practical than the equivalent aperture reflectors.</i>	<i>Larger SCTs need an hour or two to cool down outside to avoid blurry views.</i>

What’s All This About ‘Aperture’?

The ‘aperture’ of a telescope is the diameter of its main mirror or lens, which may be given in inches, centimetres or millimetres.

You can trust any astronomer when they tell you that ‘bigger is better’! A larger aperture gathers more light, which allows the image to be magnified more, so enabling you to see dimmer and/or smaller objects. Doubling the aperture gathers four times more light, as shown in the table to the right. **We think 130mm to 150mm is a good starting point.**

And ‘Focal Length’?

The ‘focal length’ of a telescope determines its magnifying power and is given in millimetres. A telescope with a longer focal length magnifies more than one with a shorter focal length when using an identical eyepiece.

Unlike aperture, bigger is not always better when it comes to focal length. As you magnify the image more it becomes dimmer, so you need a larger aperture to compensate. It’s also harder to find things as the telescope’s field of view will be much smaller, plus it will tend to wobble about more due to the wind and vibrations caused by you. **A focal length five or six times the aperture (in mm) is a good compromise, and will be described as ‘f/5’ or ‘f/6’ in the advertisement.**

Common Telescope Diameters		
Millimetres (mm)	Inches (In / “)	Light Grasp
60	2 ½	1 x
70 or 71	2 ¾	1 ½ x
80	3	2 x
102	4	3 x
127 or 130	5	4 ½ x
152	6	6 ½ x
200 or 203	8	11 ½ x
254	10	18 x
279	11	21 ½ x
305	12	26 x
356	14	35 x

Magnification and Eyepieces

Most telescopes aimed at beginners will be supplied with a couple of eyepieces. These will usually be fairly low quality but good enough to get you started. Each eyepiece will also have a focal length stated in millimetres. Lower numbered eyepieces (shorter focal lengths) magnify more than higher numbered ones. Confusing we know, but that's physics for you!

You can work out the magnification by dividing the telescope's focal length by the eyepiece's focal length. So if your telescope has a 600mm focal length, a 26mm eyepiece will magnify $600 \div 26 = 23$ times magnification compared to the naked eye. Switch to a 6mm eyepiece and you'll get $600 \div 6 = 100$ times magnification.



Eyepieces come in two diameters, **1 ¼ inches being most common**, and 2 inches being used for larger, more expensive eyepieces. More expensive telescopes will accept both sizes. You may also get a **'Barlow Lens'** which can be used to double the magnification of any eyepiece.

Types of Telescope Mount

The telescope mount is just as important as the telescope itself. A bad mount will make the best telescope hard to use. There are three types:

TIP: When observing with small kids, use a short stepladder to help them reach the eyepiece!

Altitude-Azimuth Mounts

An 'Alt-Az' mount is simple to understand and operate. You point the telescope up, down, left and right to find the objects you wish to view.

Surprisingly, the view through an astronomical telescope is reversed so pointing up moves the view down, and pointing left moves right. It's confusing at first, but you'll get used to it!

Tracking objects as the Earth rotates requires you to move in both the up-down and left-right directions simultaneously. This can be a bit tricky at high magnifications even if the mount has 'slow motion' controls like the one shown to the right.



Equatorial Mounts

An equatorial mount needs to be set up so that it is aligned to point at the North (pole) star. Tracking objects is then simply a matter of slowly turning one of the slow-motion knobs as the Earth rotates. Equatorial mounts can usually be fitted with an optional tracking motor, leaving you free to observe.

It is a bit trickier to set up an equatorial mount and to get your head around how you point it at things in the sky, but easy enough once you have seen one in action.

Both cheaper Alt-Az and equatorial mounts tend to be quite wobbly and may come with flimsy tripods. You shouldn't underestimate this problem, as even at low magnifications a bad mount can make it impossible to get a good view.



Dobsonian Mounts

The solution to wobbly views is the Dobsonian mount. This is a type of Alt-Az mount but, instead of a flimsy metal mount and tripod, the telescope is attached to a sturdy wooden box. Don't be fooled by the apparently primitive looks and technology. **We think Dobs are the best type of mount for beginners, and indeed most of the largest amateur telescopes are Dobs too!**

There's a one time 'IKEA flat-pack' assembly job, and after that you can have your Dob up and running in the garden in moments. Dobs also split down easily into box and telescope for transport by car.

Another advantage is that most of the money goes on the telescope, which will invariably be a reflector, rather than on the mount. You definitely get more telescope and a more sturdy mount for your cash than any other type of beginner telescope.

GOTO Mounts

So far we've looked at manual mounts. These rely on you to learn your way around the sky in order to find things. You also have to track them as the Earth rotates unless you have a motorised equatorial mount. All three types of mount we have covered are also available in more expensive 'GOTO' versions.

A GOTO mount has motors which moves the telescope to any object in the sky automatically and then tracks it. The mount is usually controlled by a computerised handset that looks a bit like one of those giant Nokia phones everyone had in the 1990s. All GOTO mounts need a battery or mains adaptor power supply which may not be included so please check when buying.

The advantage of GOTO mounts is that once set up and aligned, you can more easily find dim objects just by looking them up in the handset. The main disadvantage of GOTO is that each time out you have to start by aligning the mount to the sky. This is done by centring the telescope on particular bright stars, a skill requiring a bit of practice and some basic sky knowledge.



Advanced Mounts

Some Dobsonians feature **"Push To"** that guides you to the desired object using directions on a small handset. You still move the telescope by hand, making it cheaper and lighter than GOTO!

Recent (expensive) GOTO mounts have brought new advanced features such as the ability to control the mount over Wi-Fi or Bluetooth from an app on your iPhone or Android device or connect it to a PC. Some mounts also have built-in or add-on GPS receivers and alignment cameras which will complete the whole set-up process automatically.

Which Brand To Buy?

There are a number of brands aimed at beginner and intermediate astronomers. Whilst we do not endorse specific brands, there are three that offer a wider range of quality equipment:

<i>Celestron</i>	<i>Orion Telescopes & Binoculars</i>	<i>Sky-Watcher</i>
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The same Chinese manufacturers build a lot of almost identical equipment for all three, so our guide suggests the versions that are cheapest! We've omitted a few brands which offer poor quality equipment at low prices, as well as those with high price tags aimed at more advanced astronomers.

Where To Shop?

Customer service is key in case of problems, so buy from an established retailer specialising in astronomy. Avoid 'bargain' telescopes sold by supermarkets, electronics and photographic retailers. Again, we do not endorse specific suppliers. If you want to view before you buy the nearest specialist astronomy shops open to the public are:

TIP: The best telescope is the one that actually gets used! Start with a model that is small and quick to set up.

<i>The Widescreen Centre (Ely, Cambs): www.widescreen-centre.co.uk</i>
<i>Tring Astronomy Centre (Tring, Herts): www.tringastro.co.uk</i>
<i>F1 Telescopes (Sittingbourne, Kent): www.f1telescopes.co.uk</i>

Increasingly, astronomy retailers are moving to online sales only, making membership of an astronomical society one of the few ways to get hands-on with equipment before buying. Some of the best known online retailers in the UK include:

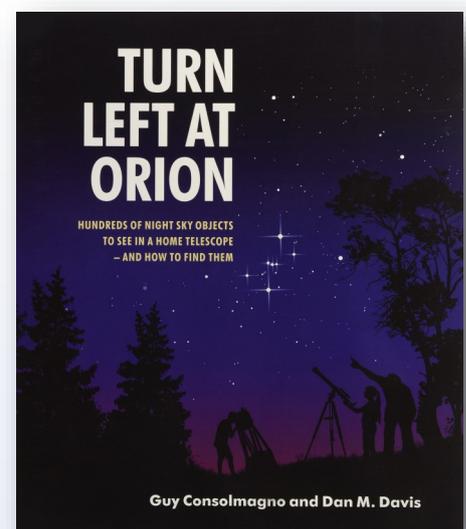
<i>Altair Astro: www.altairastro.com</i>
<i>David Hinds: www.celestron.uk.com</i>
<i>First Light Optics: www.firstlightoptics.com</i>
<i>Harrison Telescopes: www.harrizontelescopes.co.uk</i>
<i>Pulsar Astro: www.pulsarastro.com</i>
<i>Telescope House: www.telescopehouse.com</i>

Learning The Sky



“Turn Left At Orion” is essential reading for anyone beginning their journey through the night sky. With simple diagrams and advice, you'll soon be spotting all sorts of celestial wonders. Available from Amazon and many other retailers.

A good planetarium app is also invaluable for any astronomer. There are a number out there, but we like **“SkySafari 5”**, which is available for Android and Apple devices. The cheapest and most basic version has everything the beginner needs.



Telescope Guide

The telescope guide lists examples of commonly used beginner and intermediate telescopes. It is organised by approximate price at the time of writing. Do shop around though as prices change! Use your answers at the beginning of this guide to find the models that fit your needs.

Need More Help?

We can't include every telescope available, so we cover complete packages as this is the easiest and most trouble-free way to start out. If you need more help, please feel free to contact us via our Facebook page or speak to one of our friendly members at our regular stargazing events.

If you would like to get 'hands-on' with different telescopes before committing to an expensive purchase, why not become a member of North Essex Astronomical Society? We welcome new members from **complete beginner** on. It's the best way to get one-on-one advice as you start your journey through the night sky. Membership details can be found at the back of this guide.

Model	Aperture : Focal Length	Description	Price?	Who?	Size?	Hi-Tech?	Best For?
Celestron FirstScope 76mm OR Sky-Watcher Heritage 76 Orion FunScope 76mm 	76mm : 300mm (f/4)	£49 <i>Tiny Dobsonian reflector. Includes two eyepieces. Better than a toy scope. Stand on a high garden table.</i>	£				
Celestron AstroMaster 70EQ 	70mm : 900mm (f/13)	£79 <i>Entry level equatorial refractor. Includes two eyepieces. Better than a toy scope. Optional tracking motor upgrade available.</i>	£				
Sky-Watcher Heritage 100P OR Orion Sky Scanner 100mm 	100mm : 400mm (f/4)	£99 <i>Small Dobsonian reflector. Includes two eyepieces, Barlow & red-dot finder. Stand on a high garden table.</i>	£				
Orion Observer 80ST OR Sky-Watcher Startravel 80 EQ1 	80mm : 400mm (f/5)	£114 <i>Wide-field equatorial refractor. Includes two eyepieces, Barlow & red-dot finder.</i>	£				
Sky-Watcher Skyhawk 1145P 	114mm : 500mm (f/4)	£131 <i>Small equatorial reflector. Includes two eyepieces, Barlow & red-dot finder. Superior to standard Skyhawk 114.</i>	£				

Model	Aperture : Focal Length	Description	Price?	Who?	Size?	Hi-Tech?	Best For?
Bresser Messier 5" Dobsonian 	130mm : 650mm (f/5)	<i>£169 Small Dobsonian reflector. Includes two eyepieces, Barlow & red-dot finder. Stand on a low garden table.</i>	£				
Sky-Watcher Heritage-114p Virtuoso 	114mm : 500mm (f/4)	<i>£175 Table-top Alt-Az reflector with directional / tracking motors. Optional GOTO upgrade available.</i>	£				
Celestron AstroMaster 90EQ 	90mm : 1,000mm (f/11)	<i>£179 Small equatorial refractor. Includes two eyepieces. Optional tracking motor upgrade.</i>	£				
Sky-Watcher Explorer 130P (EQ-2) 	130mm : 650mm (f/5)	<i>£193 Small equatorial reflector. Includes two eyepieces & red-dot finder. Optional tracking motor upgrade available.</i>	£				
Sky-Watcher 150P Dobsonian <small>OR Orion SkyQuest XT6</small> 	153mm : 1,200mm (f/8)	<i>£209 Small Dobsonian reflector. Includes two eyepieces & finder scope. Smallest freestanding Dob.</i>	££				
Sky-Watcher Evostar-90 AZ Pronto 	90mm : 900mm (f/5)	<i>£235 Simple Alt-Az reflector. Includes two eyepieces & finder scope. Sturdy and stable mount.</i>	££				
Sky-Watcher Skyhawk 1145P Synscan AZ GOTO 	114mm : 500mm (f/5)	<i>£269 Small GOTO Alt-Az reflector. Includes two eyepieces, Barlow, finder scope. Low-cost GOTO telescope.</i>	££				
Sky-Watcher 200P Dobsonian <small>OR Orion SkyQuest XT8</small> 	200mm : 1,200mm (f/6)	<i>£285 Mid-sized Dobsonian reflector. Includes two eyepieces & finder scope. Our favourite telescope!</i>	££				

Model	Aperture : Focal Length	Description	Price?	Who?	Size?	Hi-Tech?	Best For?
Celestron NexStar 90 SLT 	90mm : 1,250mm (f/14)	£305 Compact GOTO Alt-Az Maksutov. Includes two eyepieces. Good for Moon & planets.	££				
Sky-Watcher Skymax 102 SynScan AZ GOTO <i>OR similar Orion StarSeeker IV 102mm GOTO for £517!</i> 	102mm : 1,300mm (f/13)	£329 Compact GOTO Alt-Az Maksutov. Includes two eyepieces, Barlow & finder scope. Good for Moon & planets.	££				
Sky-Watcher Explorer 130PS AZ GTi 	130mm : 650mm (f/5)	£355 Small Smartphone controlled GOTO Alt-Az reflector. Includes two eyepieces, Barlow & red-dot finder.	££				 
Sky-Watcher Star Discovery 150P 	150mm : 750mm (f/5)	£369 Small GOTO Alt-Az reflector. Includes two eyepieces, Barlow & red-dot finder. Lightweight tripod for size of scope.	££				  
Sky-Watcher Skymax 127 Synscan AZ GOTO 	127mm: 1,500mm (f/12)	£389 Larger GOTO Alt-Az Maksutov. Includes two eyepieces, Barlow & finder scope.	££				
Celestron NexStar 102 SLT 	102mm : 660mm (f/6)	£412 Larger GOTO Alt-Az Refractor. Includes two eyepieces.	££				 
Sky-Watcher Skyliner 250PX Dobsonian 	254mm : 1,200mm (f/5)	£429 Large manual Dobsonian reflector. Includes two eyepieces & finder scope. Needs storage space!	££				 
Sky-Watcher 200P EQ5 	200mm : 1,000mm (f/5)	£467 Mid-sized manual equatorial reflector. Includes two eyepieces, Barlow & finder scope. GOTO upgrade available.	££				 

Model	Aperture : Focal Length	Description	Price?	Who?	Size?	Hi-Tech?	Best For?
Orion StarBlast 6i Intelliscope 	150mm : 750mm (f/5)	£479 Table-top Push-To Dobsonian reflector. Includes two eyepieces & red-dot finder. Stand on a low garden table.	££				  
Celestron Astro Fi 125mm SCT 	125mm : 1,200mm (f/10)	£489 Small GOTO Alt-Az SCT. Includes two eyepieces. Smartphone controlled via Wi-Fi.	££				
Celestron Omni XLT 120 	120mm : 1,000mm (f/8)	£569 Manual Equatorial Refractor. Includes one eyepieces and finder-scope.	£££				
Orion SkyQuest XT8i Intelliscope 	203mm : 1,200mm (f/6)	£652 Mid-size Push-To Dobsonian reflector. Includes two eyepieces and finder-scope.	£££				 
Sky-Watcher Skyliner 200P FlexTube GOTO 	200mm : 1,200mm (f/6)	£775 Mid-size GOTO Dobsonian reflector. Includes two eyepieces & finder scope. Stable, collapsible tube, heavy.	£££				 
Celestron NexStar 6SE 	150mm : 1,500mm (f/10)	£874 Small Alt-Az GOTO SCT. Includes one eyepiece. Garish 1970s orange makes it easy to find in the dark.	£££				 
Skywatcher Explorer 200P-DS HEQ5 PRO 	200mm : 1,000mm (f/5)	£1,059 Mid-sized equatorial reflector on heavyweight GOTO mount. Entry level for astrophotography.	£££				 
Celestron NexStar 8SE 	203mm : 2,032mm (f/10)	£1,283 Large Alt-Az GOTO SCT. Includes one eyepiece. Low cost for a big SCT. Great for planets & other small objects.	£££				 

Become a Member Today!

You will get use of our observatory and telescopes, our Pulsar e-magazine, reduced admission to public meetings, access to observing sessions and members-only events. Most of all, you'll have fun and make new friends whilst learning about Astronomy. All are welcome, from beginners to experts.



NORTH ESSEX ASTRONOMICAL SOCIETY **Membership Application/Renewal Form**

Please complete the details below.

All information received is for Society use only, and will not be passed on to third parties. Car registration details are received for observatory access, for the benefit of the site owner.

Annual Membership Subscriptions are due 1st October:

£25 for an individual, £35 for a family, £10 for a Junior/Student, pro-rated for 10 months or less.

Note C&VA Policy: NEAS operates a mandated C&VA policy. Membership of the NEAS requires both acceptance and application of this Policy. This acceptance is confirmed through member signature below. Copies of this Policy are available via the Members section of the website, at the Observatory, or from the Secretary of the Society.

Name(s) _____

Address _____

Postcode _____

e-mail _____

Tel. no. _____ Mobile no. _____

Car reg _____ Make _____ Colour _____

Period from: _____ To: 30th Sept 201_

Amount due (see below) £ _____ Single Family Junior/Student

New members: To minimise the cost to the society and the environment, welcome information will be sent by email, where an email address is supplied

Please make cheques payable to: **North Essex Astronomical Society**
Direct bank transfer: **Sort code: 20-45-45, Acc. number: 53940136**
PayPal to: **northessexastro@gmail.com**

Member's signature _____ Date _____

Please return the whole of this form with your remittance (unless paying directly) to:
NEAS Treasurer: Rachel Eaton, 15 Cypress Court, Great Dunmow, Essex CM6 1ZA

Membership rates to 30th September (*or the following September)

Month of joining:	Single	Family	Junior/Student
October, November, December	£25.00	£35.00	£10.00
January	£22.50	£31.50	£9.00
February	£20.00	£28.00	£8.00
March	£17.50	£24.50	£7.00
April	£15.00	£21.00	£6.00
May	£12.50	£17.50	£5.00
June	£10.00	£14.00	£4.00
July*	£32.50	£45.50	£13.00
August*	£30.00	£42.00	£12.00
September*	£27.50	£38.50	£11.00

* Includes membership for 15, 14, or 13 months for applications received in July, Aug or Sept respectively