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STARGAZING LIVE

TELESCOPE GUIDE

BUYING A TELESCOPE

Answers to the most frequently asked questions

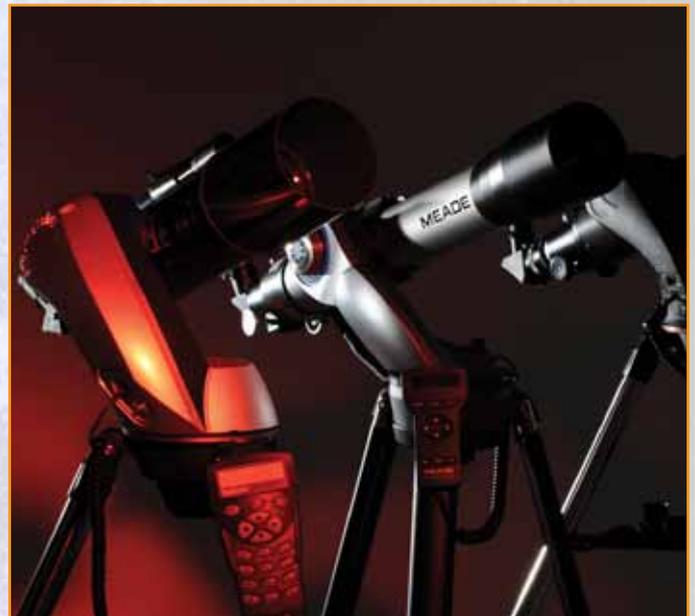
Buying a telescope for the first time can be daunting. This guide answers some of the most frequently asked questions, helping you get set up and running as quickly as possible.

IS IT BEST TO BEGIN OBSERVING WITH A PAIR OF BINOCULARS?

Without doubt a good pair of binoculars is a great way to start taking in the delights of the night sky. They are simple to use and have a wide field of view, so it's easier to hone in on a part of the sky you can see with the naked eye. When we talk about binoculars we describe them with figures – 10x50, 7x40 and so on. The first number in this description is the magnification and the second is the diameter of the front lenses in millimetres. A pair of 10x50 binoculars will magnify the view 10 times and has 50mm-diameter front lenses.

Binoculars are great for getting to know some of the basic star patterns and can show a surprisingly wide variety of objects, such as brighter deep-sky objects, sweeping star clouds along the Milky Way, craters on the Moon and even Jupiter's four main moons. For example, with 10x50 binoculars you can pick out star clusters such as the Pleiades, Double Cluster and Beehive Cluster, galaxies such as the Andromeda Galaxy, Messier 81 and 82 in the Great Bear and nebulae such as the Swan Nebula, Orion Nebula and the Dumbbell Nebula.

Binoculars are also versatile, being useful for daytime activities such as bird-watching. They also give you the chance to start exploring the night sky without having to commit to a telescope until you are ready. On the flip side, you won't be able to enjoy the more magnified, detailed views that a telescope can give. Astronomy binocular brands include Helios, Celestron, Revelation, Visionary and Opticron. Cost can range from around £30 for a pair of 10x50s up to several hundred pounds for giant 25x100 binoculars.



WHAT TYPE OF TELESCOPE SHOULD I BUY?

The simple answer is it depends on what you want to look at in the night sky. We suggest that a good all-round beginner's telescope is the Newtonian reflector. It's a simple design and is relatively cheap for the size of mirror you'll get for your money – ideal if you're just starting out. A Newtonian reflector with a 6-inch (150mm) mirror will give you good views of the brighter galaxies and nebulae and should also perform well when looking at the Moon and planets. There's also the Dobsonian – another type of reflector. If you want to chase faint galaxies and nebulae, this has a much larger mirror for its price compared to any other design because it has a simple mount.



But what about other types of telescope? A refractor is perhaps the most recognisable of all designs. This type of telescope uses a series of lenses to bring what you're looking at into focus at the eyepiece end of the tube and is great for observing the Moon or rich star clusters. Finally, there are the catadioptric telescopes that use a combination of corrector lenses and mirrors. Their compact size makes them relatively portable and their large focal ratios mean that they're ideal for lunar and planetary observing. Brands to look for when buying a first scope include Bresser, Celestron, Konus, Meade, Orion and Sky-Watcher.

WHAT DO I GET WHEN I BUY A NEW TELESCOPE?

Most starter telescopes come in a package that includes everything you need to start observing right away: a telescope tube, a mount that holds the tube stable and one or two eyepieces to magnify the view. Small, low-magnification telescopes called finderscopes are also usually provided. Some manufacturers also include other accessories, like a Moon filter, a Barlow lens that can double the magnification of your eyepieces and, in the case of refractors, a star diagonal, an angled mirror or prism inside the telescope that makes viewing more comfortable. In recent years it has also become usual to find a CD-ROM with basic planetarium software on it to help you familiarise yourself with the night sky.

HOW MUCH SHOULD I SPEND?

A good 6-inch Newtonian on a sturdy mount costs around £300 in the UK, while a good 4-inch refractor costs around £200. A 6-inch Dobsonian can cost just over £200, while a good catadioptric scope costs between £250 and £400. What's most important is that you buy from a reputable astronomical dealer. Avoid the cheap, poor-quality models you sometimes see in mail order catalogues or high street stores.

HOW CAN I GET HOLD OF A GOOD TELESCOPE UNDER £200?

New telescopes for less than £200 are available, but they will be small diameter instruments. Bear in mind that the larger and better quality the optics, the better the viewing experience. If you can invest a little more

it will make a difference. Bresser, Celestron, Sky-Watcher and Meade all have telescopes in this price bracket. For larger telescopes under £200, consider buying secondhand, there are several buy-and-sell websites that specialise in telescopes.

WHAT IS THE MOUNT AND WHY IS IT IMPORTANT?

A telescope with superb optics will always be let down by a poor-quality mount. If you can't keep the optics stable, your view of the night sky will be completely ruined, so make sure that the mount is sturdy. A heavier mount provides a more stable platform. However, it will make your telescope less portable. It shouldn't have any flimsy plastic parts and under no circumstances should it flex or wobble noticeably when set up.

There are two main types of mount that you'll come across: the altaz and the equatorial. Altaz is the simplest of all mounts. It gets its name from the way the telescope moves on the base parallel to the ground – up and down (known as altitude) and left and right (known as azimuth).

The equatorial mount (typically the German equatorial mount, or GEM) is different; one of its axes is tilted to your latitude and the other is parallel to the celestial equator. It moves in units of right ascension and declination, which are similar to longitude and latitude and mapped onto an imaginary sphere on the sky. Most Newtonians come on a German equatorial mount.

WHAT IS THE LITTLE TELESCOPE ON TOP OF THE BIG ONE?

This is the finderscope. It has a wider field of view than the main telescope and it has crosshairs, so you can find things and aim the main scope more easily. Before observing you'll need to align the main telescope and the finderscope. In the daytime, point the main telescope at a distant stationary object like a telegraph pole. Be careful not to look at the Sun or you could damage your eyes. Centre the top of the telegraph pole in the main eyepiece and then adjust the little screws around the finderscope, one by one, to centre the top of the pole in the crosshairs. Once done, you'll be able to point at something with the finderscope and it will appear in the main eyepiece.



WHAT IS THE EYEPIECE FOR?

Most telescopes have one or two eyepieces included in the price. They come in two standard barrel sizes to fit into the telescope's focuser – 2-inch or 1.25-inch.

The number on the eyepiece is its focal length, measured in millimetres. The smaller the number the greater the magnification it will give when used. Two good quality eyepieces with a small (10mm) and a larger (20-40mm) focal length will provide you with a decent range of magnifications to get you started. However, if you had to choose just one, a general purpose beginners' eyepiece is a 20mm Plössl. Only use or buy eyepieces that have glass elements, because plastic lenses will almost always provide disappointing views.

WHAT ARE THE MOST IMPORTANT TELESCOPE FEATURES I NEED TO KNOW OF BEFORE I BUY?

When you're buying a car you want to know how fast it can go, how big it is and whether it's going to be any good for what you want. A telescope is no different, so let's look at some of the specifications you'll need to know.

First off, don't be fooled by claims of massive magnification. That's not the measure of a good telescope. Even poor telescopes can magnify many times. What's really important is the quality of the lenses and the size of the telescope's lens or main mirror (its aperture, measured in millimetres). The bigger the mirror or lens, the more light can be captured and the brighter a distant celestial object will appear.

Another important specification is the focal length. This is the distance between a telescope's main lens or mirror and the point at which an image is brought into focus. It can be used to find out what magnification you are viewing the night sky with. The magnification is the focal length of the telescope divided by the focal length of the eyepiece.

You'll also encounter the 'f' number, which is the focal ratio of the scope. This tells you what the scope is good for. A lower focal ratio of around f/5 is great for observing large, faint objects like galaxies, while higher focal ratios around f/10 are good for looking at brighter things like the planets.

Also, the higher the focal ratio, the narrower the field of view that you see in the eyepiece. So if you want to study small features on the Moon, then a scope with a high focal ratio is for you.

CAN I OBSERVE THE PLANETS AND DEEP-SKY OBJECTS SUCH AS GALAXIES AND NEBULAE PROPERLY WITH THE SAME TELESCOPE?

All telescopes will show you a range of objects, from planets to galaxies, but some will offer better views of planets and lunar detail, while others provide better deep-space views. For observing the planets (and double stars too), a long focal length telescope will give good results. The longer focal lengths give a higher magnification with any given size eyepiece. Short focal length telescopes give great deep-sky views, especially of galaxies and nebulae, but can struggle with fine detail on the planets.

IS IT WORTH CONSIDERING A COMPUTERISED GO-TO SCOPE?

Go-To telescopes come with an in-built computer and handset that, provided they are set up correctly, automatically aim the telescope and track an object. Although this is helpful, we'd recommend that you opt for a scope without Go-To as your first-time buy. If you aren't familiar with using a telescope, setting up a scope without Go-To is much easier. A non-Go-To telescope is also much cheaper and will be a gentler introduction to how telescopes work.



I'VE UNPACKED THE SCOPE – HOW DO I SET IT UP?

For detailed instructions it's best to have a good read of the manual, but here are a few tips. Set up the tripod and mount arrangement first. Make sure any leg screws are secure to take the weight of the telescope. If you have an equatorial mount make sure that the 'north' leg is indeed pointing north. Check that the telescope tube is secured firmly in its tube rings and that it can't slip out of them. When setting up a Newtonian, position the tube of the telescope in the rings so that you can easily look into the eyepiece. And remember, it'll help if you balance the telescope and counterweights before observing.

WHY DO THE MOON AND STARS WOBBLE WHEN LOOKING AT THEM THROUGH A TELESCOPE?

That's because of undulations in the atmosphere, which causes the view to shimmer. It might also be because of how and where the telescope is set up. Always allow the scope at least an hour to cool before using it – this reduces the air currents that cause this shimmering effect. Don't observe from indoors pointing out of a window or skylight, or even just outside a door. This is because heat escaping from the building will cause the view to boil so much that you may as well be observing from the bottom of a swimming pool!

WHICH TELESCOPES ARE THE MOST PORTABLE?

A portable telescope makes it easier to travel to darker observing sites or to one of the many star parties across the UK. Most refractors are fairly portable – it's the mount that can be a key factor in how portable a system is. More portable mounts break down into manageable sections – usually the tripod, main mount and counterweights.

It's often larger reflectors that are the most bulky. If portability is very important then consider a catadioptric telescope such as a Schmidt-Cassegrain or Maksutov-Cassegrain. Their combined mirrors and lenses fold the light path into a much more compact tube, making it possible to get even a 14-inch telescope into the back seat or boot of a car.

I WANT A VERSATILE SCOPE FOR BIRD-WATCHING AS WELL AS ASTRONOMY. WILL SOMETHING COVER BOTH?

For something that can cover not just bird-watching but any kind of nature spotting and sporting activities alongside stargazing, spotting scopes are worth considering. Because they're not mainstream astronomy scopes, they're easily overlooked but they can do a lot more than just bird-watching. They can be attached to a normal photographic tripod, so don't need a complicated mount, and many also have a built-in zoom eyepiece that offers a range of magnifications. Celestron, Acuter, Sky-Watcher and Revelation are among the brands whose ranges include spotting scopes, which cost around £300.

APART FROM A SCOPE, WHAT EQUIPMENT WILL I NEED TO BEGIN TAKING ASTROPHOTOS?

All you need to take simple, wide-field photos of the night sky is a camera. Even with a compact camera you can take images of brighter night-sky objects. A wide aperture setting, decent ISO sensitivity range between 100 and 6400 ISO, vibration control and night scene options are all useful on a compact camera if you want to take photos at night. Suitable compacts from Canon, Fuji, Nikon and Sony cost around £200.

Digital SLR (DSLR) cameras are better suited to astrophotography. As their settings are more adjustable, they can capture fainter night sky objects. DSLRs from Canon, Nikon, Olympus and Sony start at around £300.

All cameras will only be able to take wide-field photos unless attached to a telescope or telescope lens. The easiest way to fix a compact camera to a scope is with a digital camera adaptor. These cost about £30 and fit around the eyepiece, holding the camera steady so that it can capture the magnified view. Similar adaptors are also available for smartphones and cost around £60.

A DSLR camera can be fitted into a telescope's focuser with an adaptor ring and an eyepiece barrel, so that the scope effectively becomes a telephoto lens. These adaptor rings, called 'T' rings, will be specific to your camera model and cost around £20. A 2-inch eyepiece barrel is best, which will also cost around £20. It should have a male T-thread so that you can screw it into the adaptor ring.

WHERE CAN I GET EXTRA ADVICE ON WHAT I NEED TO GET STARTED?

A great place to get extra advice on a first telescope is at your local astronomical society or club, or at any public star party, such as those organized in association with Stargazing LIVE. At these you'll be able to look through telescopes before making a decision and you'll find many people willing to give friendly advice. National Astronomy societies such as the British Astronomical Association and the Society for Popular Astronomy are also great sources of advice and help.

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