

Guide to buying & using your first telescope

By www.nztelescopes.co.nz

Let's start with some basic rules:

Never buy a telescope in a department store. I used to qualify this rule, but I've decided to make it absolute. Similarly, don't buy telescopes from catalogs, stores that specialize in high-tech toys, catalog showrooms, etc. Don't buy from anyplace that doesn't do a major business in astronomy related tools.. Talk to the people first and ask for advice if required, visit your local astronomy club for hands on advice.

Magnification by itself is meaningless. Don't choose a telescope by its advertised magnification. The way to compare similar telescope is by aperture; that is, the size of the objective lens or mirror. As a rule of thumb, few scopes can deliver more than 50x per inch of aperture under the best conditions; That means that the 2.5" (60mm) telescope advertised as a "625x telescope!" is really a 125x scope at best! A lot of the really interesting objects out there are very large, but very dim. The Great Galaxy in Andromeda - one of the most majestic sights in the sky- is eight times the size of the full moon, but a lot dimmer. A magnification of 20-40x is all you'd ever want to view it. This leads to...

There's no substitute for aperture. All things being equal, size counts. Larger is better. But there's a caution that goes with this:

There's no substitute for optical quality. A small scope with excellent optics can see more than a large scope with mediocre optics.

So aperture with quality glass is what's required, watch out because some cheap scopes have plastic lens.

Like many astronomers we recommend starting with a minimum of 70mm aperture, so you really do see some good detail, 60mm and 50mm scopes (mostly only toys) let in minimal light, if your looking in the budget area of 60mm or 50mm telescopes we suggest a good set of binoculars instead, they will show much more detail.

There's no substitute for darkness. What does this mean? It means if you have to choose between a huge scope that sits in your light polluted city back yard, and a small scope that you can carry out to remote, dark areas, go small and transportable. I can see more with my 2.7" scope under a really dark country sky than I could with my 10" scope in my suburban back yard.

The smaller the scope, the more often it gets used. My 9x63 binoculars get used just about every clear night. The 10" Newtonian that I spent 6 months restoring and improving spent most of its life in my garage. Loading it into the car- a five-foot long tube, and a huge mount made of steel and cast iron that weighed well over 100 pounds- was a major undertaking.

The mount is as important as the scope. Without a solid, steady mounting, you can't even focus properly, let alone view or do things like photography.

That's why those simple-looking Dobsonian reflectors are so good. They're as stable as a rock. Most good telescopes have metal mounts, avoid plastic rubbish.

Before You Buy...

A telescope is a useful tool- but only if you know what to do with it. Before you decide to get a telescope, you should spend a little time reading about telescopes to get a better idea of what they can do, and to better understand your own needs. If at all possible, find an astronomy society or club you can visit to get some personal experience using different telescopes. Too many people spend a lot of money on a scope with unrealistic expectations of what they'll be able to see. Others get discouraged when they find they can't just point the scope heavenwards and see amazing sights. It takes some work.

Know what to expect

The views through your telescope simply will NOT match what you see in astrophotos in magazines or even on the box of your scope. Period! First, you will not see nebulae in color, planets will look tinier than you expect and will lack most of the color and contrast you see in books and magazines. Most people that look through a telescope for the first time are somewhat disappointed about what they see, or what they don't see. Don't get me wrong, you will never forget the first time you see Saturn or the Moon in a telescope and the "Wow!" that escapes your lips will amaze you also, but the "faint fuzzy" stuff often disappoints first time viewers.



A new guide to getting started in Astronomy from Celestron, excellent publication and its free.

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Setting up and using a telescope FAQ (frequently asked questions)

I have assembled my telescope. What adjustments do I need to make to my telescope before I begin to observe?

After your telescope is assembled, you will need to adjust the finder scope. The finder scope is the small telescope on top of the main telescope. When your finder scope is properly adjusted, any object you have centered in it will also be visible in the eyepiece of the main telescope. A little effort here will make the telescope much easier to use at night.

How do I adjust the finder scope?

It is easier to make the initial adjustment to your finder scope by day than to fumble around with the adjustments in the dark. Insert the eyepiece marked with the biggest number in the telescope. Focus on a distant object (far out on the horizon, if possible, ie power pole etc) and center it in the eyepiece field of view. Securely lock the telescope into position on the tripod. Adjust the finder scope (in its mount or with adjustment knobs if provided) until the object centered in the eyepiece of the telescope is also centered in the finder scope. When you begin your observing session under the stars, you will need to make more precise adjustments to your finder scope , but this will get you started.

Where is the best place to observe with my new telescope?

The best locations for astronomy will be rural areas far from large cities that pollute the night sky with outdoor lighting. This "light pollution" washes out many of the faint objects of interest to an astronomer, as does the light from the moon. A small telescope when used under a dark, moonless sky can match the performance of a larger telescope used under a light polluted sky or a moonlit sky. (Most astronomers do not hold the moon in high regard for this reason.) If your in the center of a town or city, find a spot around your home that is shaded from the street lights, another option is to cover your head with a black cloth when observing, this will improve the detail you see immensely.

I will be observing at home. Where should I set up my telescope ?

Not in your living room. Observing through the window of a house will drastically reduce the performance of your telescope. Go outside. If possible, set your telescope up away from buildings, parking lots, patios or other objects -wooden or cement - that absorb heat by day. These objects radiate heat back into the sky at night and will create air currents that degrade the images in your telescope . A backyard lawn, shielded from streetlights is a good place for suburban dwellers to begin.

Can I observe right away after my telescope is set up?

Yes, but your telescope won't be operating at peak efficiency and neither will you. For you, it will take at least a half-hour of uninterrupted darkness for the pupils of your eyes to open to their fullest and be at their most sensitive to faint objects in the night sky. Furthermore, sudden exposure to bright light will quickly cause you to loose your dark adaptation. To read a star map or see the controls on your telescope , cover your flashlight lens with several layers of red plastic or paint it with several layers of red nail polish. Red light has the least effect on dark-adapted eyes.

For your telescope, it will require time for the optical system to "cool" to the temperature of the night air. While it is cooling, the lens or mirror will be changing shape and images produced will be distorted. Cool-down time is short with a small telescope, but it may take thirty minutes or more for a larger telescope to be at its best.

Where do I begin? What should I observe first?

Try to observe with a plan. Choose a few easy objects (large and bright) that can be seen from your location and time of year. Check one of the popular astronomy websites such as Sky&Telescope, <http://skyandtelescope.com/> and Astronomy Magazine, <http://www.astronomy.com/> for a list of objects currently visible in the night sky. Observe one area per night, rather than trying to explore the entire night sky in an evening, take your time, smart phone and tablets are very useful to choose targets.

What does the number on the eyepiece mean?

The number on the eyepiece is the focal length of the eyepiece. It is not the magnification of the eyepiece. The larger the number the lower the magnification and wider field of view, you maybe surprised that the most useful eyepiece in your kit will be the low powered wide field option.

How do I know what the magnification of the eyepiece will be?

The magnification of any telescope eyepiece used with your telescope will be the focal length of the telescope (consult your manual) divided by the focal length of the eyepiece. A telescope with a focal length of 1200mm will yield a magnification of 60x when you insert a 20mm eyepiece into the focuser. A telescope with a focal length of only 600 mm, however, will yield only 30x when used with the same 20mm eyepiece.

Which eyepiece should I use to begin observing?

Always start observing with the lowest magnification eyepiece available until you become skilled in the use of your telescope. This will be the eyepiece marked with the BIG number (longer focal length), not one of the smaller numbers. Again, the number you see on the eyepiece is the focal length, not the magnification. Trying to use too much magnification will often result in an image that is blurred, you can't control what's in the atmosphere.

Why should I start with a low magnification eyepiece?

A low magnification eyepiece has a wider field of view (the amount of sky you see when looking through the eyepiece) than a high magnification telescope eyepieces. The low-magnification eyepiece therefore makes it easier to "capture" an object you are trying to find in your telescope. Your lowest magnification eyepiece will also give you the sharpest image as well as the brightest image. Your eye will discern the detail.

How do I use a high magnification eyepiece?

Once you have located an object with your low magnification eyepiece, move the telescope so the object is as close to the center of the telescope field of view as possible. Replace the low magnification eyepiece with one of higher magnification. If the object is not visible after you have changed to the high magnification eyepiece , go back to the low magnification eyepiece and start again.

Why do things seem to get darker as I increase magnification ?

A basic law of optics states that as magnification increases, image brightness decreases. In fact, if you increase magnification enough, an object will become too faint to see. This happens sooner in a small telescope than large telescopes.

What is a Barlow lens and how do I use it?

A Barlow lens is a lens that you use with your eyepiece. A Barlow lens will double (2x Barlow) the magnification of any eyepiece that you attach to it. To use a Barlow lens, remove the eyepiece from the focuser, insert the Barlow and then insert the eyepiece into the Barlow. Remember, though, that a Barlow is best used with low magnification (long focal length) eyepieces. When used with high magnification eyepieces, it may produce more magnification than your telescope can use.

Why do objects in the eyepiece drift out of the field of view after a few moments?

The telescope is not only magnifying the object you are observing in the sky, it is also magnifying the earth's rotation! The more magnification you use in your telescope, the quicker an object drifts out of the field of view. Manual telescope mounts will require you to continually "recapture" the object by moving your telescope slightly. Motorized mounts move the telescope for you and keep the object in the eyepiece.

How much magnification should I use?

Use only enough magnification to provide a useable image. When you reach a point where the image has become so blurred as to lose useful detail, you are using too much magnification! At what point this happens depends on the object you are observing, the seeing conditions (atmospheric clarity and stability) and the size of your telescope (you can get more magnification out of a large telescope before images begin to blur).

What can I expect to see in my new telescope ?

You will be able to see many of the same amazing things you see in magazines and books, but the images produced in your telescope will be smaller and less spectacular. The images in magazines and books are produced by large observatory telescopes that take long exposure photographs with special cameras. It simply isn't realistic to expect a small amateur telescope to produce visual images of the same quality, that being said, the views through a good entry level scope (70mm refractor) or larger will show many spectacular objects.

If the images in my telescope are not as beautiful as what I have seen in pictures, why bother looking through my small telescope at all?

There is so much more to that little smudge of light you see in your eyepiece than meets the eye! Spend a little time and effort to learn about the things you see in your telescope and you will appreciate them much more. Remember, that little smudge of light may actually contain billions of stars and its light may have taken many millions of years to reach your telescope.

Besides, much of the thrill in amateur astronomy is seeing the glories of the night sky with your own two eyes. The difference between seeing a picture of Saturn in a book and seeing Saturn in your backyard through a telescope is a lot like the difference between seeing pictures of Alaska in a book and going to Alaska to see it for yourself.

Amateur astronomy is also about the challenge of finding faint, hard to see objects. This often frustrates the beginner (hence the popularity of computer GOTO telescopes) but it also keeps the die-hard enthusiasts out late into the night. Even if you use a GOTO telescope, you owe it to yourself to learn how to navigate by means of a star map . There are no words to describe the thrill of finally seeing a faint galaxy or nebula after several hours or even nights of looking for it.

Lastly, there is a great amount of satisfaction that comes with knowing your way around the night sky. At a time when many of us feel alienated from the natural world, astronomy provides a way to reconnect to the universe around us.

What type of telescope mount should I use?

There are two main types of mounts, ALT-AZ, and EQ (equatorial) . Alt-az is the simplest mount, easily moved horizontal and vertical, some of these mounts are also motorised and have goto. The draw back with the Allt-az mount is it does not counteract the earths rotation, so even though its motorised if you use Alt-az for imaging you are limited to about 30 second exposures.

Contrary to belief by lots of people EQ mounts are not hard to use, the advantage of an EQ mount is it allows the telescope to move in the same way the earth does, so if set up correctly you can use for long exposure photography.

What does aligning a goto telescope or EQ mount mean?

If your using a EQ mount or a goto telescope you need to align to the South Celestial pole (true south on a compass), see Solar align below. Once the mount is facing south, you need to use at least two of the brighter stars to align with, its vital you know at least six of the brighter stars in the night sky, the best time to learn these is at dusk.

Your goto scope will ask you to center an alignment star, follow that procedure and then repeat for the second alignment star, once you have completed this, the telescope will know where its positioned on the earth. The more accurate you complete this task the more pleasure you will have viewing.

On an EQ mount you also need to set the latitude in degrees, eg: 44 degrees south for example.

Solar alignment?

It can be hard to find true south, an easy way is to use solar align. When the sun crosses the meridian put a pole in the ground (about one meter long) as the sun crosses the meridian it will cast a shadow, this is true south, mark the position and your done, you can then place the tripod back in the same position (put some markers down), this will reduce your set up time. To find when the sun crosses the meridian, look it up on the web, or use a planetarium software .