

Helping Santa Choose a Telescope

Every year, Santa makes mistakes.

A first telescope is purchase with such hope and much love.

Most of these telescopes will disappoint

It is the thrust of this presentation to hep you avoiding the inexpensive “100 dollar” telescope and understand why.

(*From Michael J Edelman at <http://findascope.com/#basics>*)

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 "close-out" 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.

"Christmas Trash" telescopes. Every fall, thousands of cheap, useless telescopes flood the toy stores and department stores. These instruments look like telescopes, and are offered at what look like bargain prices. And they're junk. These are what we call "Christmas Trash" telescopes. They have badly figured lenses- some of them plastic- cheap, wobbly mountings, unusable eyepieces, and outrageous claims of 400x and 640x, and sometimes 1200x magnification. Often they're sold in respectable department and discount stores. Stay away from these. They are a waste of money, and will do nothing but destroy a child's interest in astronomy.

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:

(*From Michael J Edelman at <http://findascope.com/#basics>*)

There's no substitute for optical quality. A small scope with excellent optics can see more than a large scope with mediocre optics. I stood in line at a star party a while ago to look at M31, the Great Galaxy in Andromeda, through a 21" telescope. I imagined I'd see dust lanes, structure... what I saw was a fuzzy blob of cotton, with less structure than I'd seen in my 3.5" Questar! The owner was as proud as can be of this white elephant. He'd never looked though a good scope. See the FAQ for some comments on why a high-quality small scope can be a far better choice than a large scope.

I just picked up a 40mm Unitron refractor made in the 1960s- that's a 1.6" telescope! But it has a very long focal length (700mm- that's f/17.5), very high contrast, and a really solid mount. It can split double stars and provide planetary views that would be impossible in a lot of cheap department store scopes. It sold for \$75 back in the 1960s; that's close to \$500 in 2007 dollars.

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 8x56 binoculars get used just about every clear night. The 2.7" Pronto comes out a lot too; it only takes a minute to set up. The 4" TeleVue Genesis comes out a number of times every week in warm weather, and occasionally in cold weather. 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. Those scientific looking mounts on cheap telescopes may look good, but they're absolutely worthless. They shake like crazy and make focusing impossible. That's why those simple-looking Dobsonian reflectors are so good. They're as stable as a rock. Even my little 2.7" Pronto is mounted on a TeleVue Upswing head on a Gitzo 320 tripod- that's a pretty heavy-duty photographic tripod that costs \$300 by itself! Add the Upswing and you're talking \$460 for a simple alt-az mount to support a 2.7" scope. Now you don't have to spend that much, but it points out why a \$120 refractor with included tripod and head isn't going to be terribly stable.

Absolutely reject any scope with plastic 0.965mm eyepieces.

Money spend on such eyepieces is wasted.

They have a tiny lens through which it is difficult to see.

They don't let light all the through. Getting lots of light from a distant object into your eye is the whole reason for a telescope.

These are both 25 mm focal length eyepieces. If you could put them in the same scope they will have identical magnification, but which one would you rather look through?

Remember what I said about money spent on eyepieces? You will want more eyepieces.

The bottom row shows the lenses which came with a “100” dollar department store telescope.

The middle row are 1.25 diameter lenses I used with my amateur telescope.

The top row containing only one 2 inch diameter lens is the lenses which shows the most wonderful view I have ever seen of the great nebula in Orion. I saw color!

All these lenses are arranged from left to right giving more magnification on the right.

So what might you conclude?

- The 100 dollar telescope gives you high, but it is unfortunately useless magnification.
- You have to spend more money to get low but high quality mangification.

Lenses collect light to make dim objects easier to see. Light gathering is proportional to area. What is the formula for Area anyone?

Area is πR^2 .

Area of 7mm diameter pupil is about 38 mm^2 .

The 60 mm telescope objective collects 2826 mm^2 .

One 50 mm binoculars objective collects 1962 mm^2 but there are two for a total of 3925 mm^2 collecting area.

This is 38% more light although it is spread into two eyes.

Compared to the unaided eye, binoculars at $1962/38$ is a factor of 51 better!

WOW.

When you double the magnification you spread the light over four times the area which reduces the brightness to 25% of the previous.

The department store telescope has lowest magnification of $900/25 = 36$. The binoculars have a magnification of 10. Images in the binoculars are $3.9*3.6 = 12$ times brighter.

Your First Purchase

Do not rush to purchase a telescope, buy a magazine: Astronomy or Sky and Telescope. There you can read more about the hobby and the equipment and see the advertisements of the suppliers of better quality equipment.

Subscribe to one or both.

Meet other amateurs and get help and experience.

Amateur astronomy has several activities: Learning your way around the sky. Learning what kind of objects there are to view and learning what kind of instruments with which to view them. Watching Meteors requires only blankets and / or reclining chairs and often warm clothing. Some activities require permanently mounted telescopes with dedicated buildings and very expensive accessories.

Go slowly. Learn before you spend your money.

Set some money aside now. Get a better telescope later.

Sky charts help you learn your way around.
You will be lost in the sky without charts.

There are many free sources.
Here are two.

Ideal for getting started, these charts from NASA have some familiar sounding terms and build on them. The most prominent asterisms are marked so you can begin to learn the sky.

The seasonal charts show help you find your way around the sky and offer some stories (mythology) to help you remember.

Set more money aside now. Get a better telescope later.

Planetarium

Cartes du Ciel (Chart of the Skies):

<http://www.stargazing.net/astropc/>

Find a planet or a galaxy and more.

Moon

Virtual Moon Atlas

<http://www.ap-i.net/avl/en/start>

The moon changes night to night and can be seen even in the city.

Use this free software and ...

Set more money aside now. Get a better telescope later.

Meet Local Amateur Astronomers,
Got to Star Parties

Spend a few bucks and join a club here in East
Tennessee: **SMAS** (<http://smokymtnastro.org/>),

Tamke Allen Observatory and Orion.

Visit the **Heritage High School Planetarium** in
Blount county.

BAS in Chattanooga

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Your Second Purchase and More

Binoculars. Must have $\frac{1}{4}$ -20 tripod mounting thread. Aperture is important get at least 10mm as is independent focus adjustment. Check for good collimation. Avoid Zoom binoculars.

You want to spend about 100 dollars or even a little more for this. About the same you would for the department store telescope but you will get much more reward for your expenditure.

For what else can you use binoculars?

Sturdy Tripod which can tilt up.

Optional Parallelogram Mount, if you are handy, you can make such a mount.

Get or Make Gadgets:

Red flash lights, LED or a red filter.

Get a few. Sketching pad, pencils and pencil box. Bright flash light, not for use during observing but to find dropped stuff before heading home. Green Laser Pointer (not for children, use responsibly). Thermos with coffee or hot chocolate and some spare cups for you and your friends.

This is one of the most important accessories.

Unfortunately there is a price gap between the binoculars you want to have and the telescope you should consider filled with a lot of scopes you will quickly out grow.

Set more money aside now. Get a better telescope later.

A DIY Project

Great binoculars for astronomy have large objectives. Even a 10 by 50 with 50 mm objectives get heavy and wobbly when hand held.

A 20x100 binoculars weights nearly 10 lbs.

You can not use them with out some kind of mount or support.

Here we see a group of young astronomers observing with the aid of parallelogram mounts at the Tamke-Allen Observatory.

Build your parallelogram mounts for low cost.

Set more money aside now. Get a better telescope later.

Your First Scope and Beyond

A SMAS Member Recommend:

A Dobsonian, the largest that can fit into one's car. I recommend the 8 to 10" with a 2 inch focuser. Do not forget to get low power eyepieces with wide field of view. You will always be able to use and have fun with this scope. "Push to" or "Go to" is optional.

They are the very best value.

In 2009 you can get Orion SkyQuest XT10 Classic Dobsonian Telescope

- * 254mm aperture and 1200mm focal length for glorious views of the moon, planets, galaxies and nebulas

- * The ultra-stable Dobsonian base keeps the tube perfectly balanced for point-and-view ease of use

- * Now includes an upgraded 2" Crayford-style focuser that accepts 1.25" and 2" eyepieces

- * Includes 25mm Sirius Plossl eyepiece, EZ Finder II reflex sight, collimation cap, and FREE Starry Night astronomy software

- * Big-aperture optics + point-and-view ease of use = out-of-this-world value

For \$499.95

You are unlikely to outgrow this telescope and if you do you will thank us for starting you with this one.

I recommend the 8 to 10" with a 2 inch focuser. Do not forget to get low power eyepieces with wide field of view. You will always be able to use and have fun with this scope. "Push to" or "Go to" is optional. And can be added later

More money burning a hole in your pocket?

An 8, 10 or 12 inch SCT with an equatorial mount. The 12 inch borders in difficult to impossible for one person to move. Get a digital SLR camera like the Cannon D5 and you are set to take images.

High F ratio refractor for planetary observing.

Solar filters for safe sun spot observing or a dedicated solar telescope.

Narrow band filters for visual and photography.

Radio telescope.

Minivan or RV with telescope trailer to visit star parties.

Mountain top home in Arizona with observatory.

Please take the one page notes we have prepared with you.

