



Here's how  
to avoid  
buying an  
expensive  
doorstop.

# Hobby Ki

Every January my astronomy club hosts a workshop in which we help people learn how to use the telescopes they got for the holidays or tune up scopes that have been gathering dust in closets. And every year we face the same problem: how to gently tell some of them that what they've got is better suited for a boat anchor than for astronomy.

It may be hard to believe, but some telescopes are worse than having no scope at all. When you want to enjoy a night out under the stars, you're better off with a pair of binoculars or just with your naked eyes than with a telescope that can't be aimed easily and doesn't show a pleasing view of whatever you do manage to point it at. I've watched people spend all night trying to find something, *anything*, to look at, often

spending their entire time fiddling with the scope rather than observing the sky. It only takes a couple of nights like that for a person to decide that astronomy isn't any fun — thus the term “hobby killer.”

As with so many other things in life, education can help you avoid making frustrating mistakes. If you're a beginner, a few minutes reading this article before you buy a telescope can save you a lot of disappointment later. Making an informed choice can get you a scope that will provide you with many years of enjoyment.

So what makes a hobby killer? Many factors add together to make a lousy overall package. Chief among them are aperture, eyepieces, and the mount.

## Aperture

A telescope's primary job is to gather light and squeeze that light down into a small beam that it directs into your eye. It stands to reason that the more light you gather, the more you can see. So in general, the bigger the aperture (the diameter of the objective lens or primary mirror) the more useful the scope. That's true up to a point, but if you buy a scope that's too big and unwieldy, it could become a hobby killer simply because it's too difficult to take outside and set up. What you want is the right-size scope for your interest level and ability.

Anything below about 3 inches (76 mm) in aperture is likely to be too small to provide a pleasing view of anything more than the Moon and a few bright star clusters. Small scopes tend to be low-quality, too, with uncorrected objective lenses that display color fringing around bright objects and often won't even come to sharp focus. So as a general rule, stay above three inches in aperture. There are, of course, some very high-end small scopes, mostly optimized for astrophotography. The price tag will tell you which is which.

Most small hobby killers tend to be refractors (with an objective lens in front) rather than reflectors (with a mirror at the bottom). Mirrors are easier to make than lenses, so within any particular price range reflectors tend to be larger. So a typical low-end reflector will be 4" or so in diameter. A very common size is 4.5", and 4.5" is plenty of aperture for a first scope. You can see hundreds of objects with a good 4.5" scope.

The key word is "good." There are rotten reflectors as well as rotten refractors. What makes a reflector good? Most



**KILLING THE VIEW** While this scope may look pretty good, its equatorial mount, lousy finder, 60-mm aperture, 0.965" eyepiece, and 3× Barlow make it a hobby killer.



**HARD TO HANDLE** Even a great scope can be a hobby killer if it's too difficult to carry.



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important: Is the primary mirror parabolic or spherical? A spherical primary is cheaper to make but provides a less pleasing view. You can get away with a spherical mirror if the focal ratio is "slow" enough, say f/8 or more (i.e., the focal length of the scope is 8 times the diameter of the mirror), but even then a parabolic mirror will work better. If a manufacturer of a low-end telescope goes to the trouble to parabolize the primary mirror, then odds are it's a reasonably good telescope.

There's one design you should avoid at all costs: the "Bird-Jones" reflector. The Bird-Jones design uses a spherical primary, and a fast one at that, in an attempt to keep the tube shorter than average. Manufacturers of this design correct for spherical aberration and increase the focal length



by placing a corrector lens at the inner end of the focuser. The corrector lens is supposed to make everything all right again, but it never does. The view through every Bird-Jones scope I've ever looked through has been uniformly awful. There might be a decent Bird-Jones telescope somewhere out there, but if there is, I've never seen nor even heard of it.

## Eyepieces

In the early days of telescopes, eyepieces were single pieces of glass that essentially acted as magnifying lenses that let you examine the image created at the focal plane by the objective lens or primary mirror. Modern eyepieces do the same job, but they use many more lens elements to correct for color fringing and other optical aberrations.

Different designs of eyepiece give you different fields of view. Some, such as the Orthoscopic design, are like looking through a soda straw, while other exotic wide-field designs are like sticking your head into the bubble-shaped observing port on the International Space Station.

Guess which kind you get with a hobby killer? Most of them come with "Huygens" eyepieces, which were state of the art when Christiaan Huygens invented them . . . in the 1660s. We've advanced a bit since then. You want at least Kellners, or better yet, Plössl. Plössl eyepieces are probably the best value you can get in an inexpensive eyepiece.



▲ **COMMON FORMATS** Avoid scopes that use 0.965" eyepieces. *Left to right: 0.965", 1 1/4", and 2" eyepieces.*

Also beware of teeny-weeny eyepieces. Good eyepieces are either 1.25" or 2" format, meaning their barrels are meant to fit into 1.25" or 2" focusers. A lot of hobby killers use 0.965" eyepieces, which are almost always garbage and are hard to replace with better-quality designs due to this size limitation.

## Magnification

You'll want more than one eyepiece, because eyepieces are how you control the magnification of your telescope. You



**STARTING OUT RIGHT** The Orion StarBlast 4.5 Astro Reflector Telescope is an excellent starter scope.



**STEPPING UP** A 6" (seen below) or 8" Dobsonian is a great step up from a 4.5" StarBlast.



calculate magnification by dividing the eyepiece focal length into the telescope's focal length. For instance, a 900-mm telescope with a 25-mm eyepiece gives you  $36\times$  —  $(900/25 = 36)$ .

You might think you want the highest magnification possible, but that's not so. The higher the power, the smaller the field of view, which means you'll only see a part of M45, the Pleiades star cluster, or M31, the Andromeda Galaxy. Also, the higher the power, the fuzzier the view. A good telescope lets you reach about  $50\times$  per inch of aperture before the fuzziness gets out of hand, so a 3" scope would let you use  $150\times$ , but beyond that you're just magnifying the blur, a phenomenon known as empty magnification. That means a 3" by 900-mm telescope can use a 6-mm eyepiece, at best —  $(900/6 = 150)$ .

So there's a clue when you go shopping. Does the ad on the website or on the box tout the telescope's magnification? If it's a 3" aperture and they're advertising that it will do "675x!!!" they're blowing smoke. Move on.

Most hobby killers will come with a 4-mm eyepiece, which is nearly useless on its own, but it will also come with a Barlow lens, which increases the magnification of whatever eyepiece you put into it. Most Barlows multiply by  $2\times$ , so your 4-mm eyepiece plus Barlow on that 900-mm scope gives you a whopping  $450\times$ , or  $(900/4) \times 2$ . Remembering our  $50\times$  per inch rule, you would need a 9" diameter telescope to use  $450\times$  effectively.

What you want for your telescope is a good low-power eyepiece, probably a 32-mm or 25-mm Plössl, and a medium-power eyepiece, around a 10-mm Plössl. You can increase your collection as you gain experience.

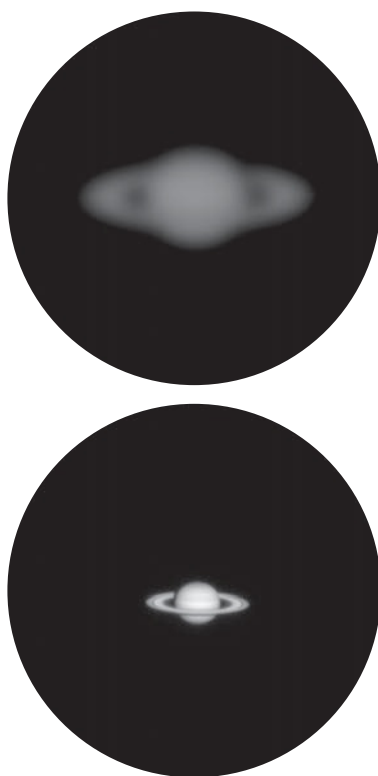
## The Mount

This is the real killer. A great scope with the best eyepieces in the world can still become a hobby killer when it's put on a lousy mount.

I'll make an absolute statement here: An equatorial mount is a poor mount for a beginner. Later on, when your hobby has flourished, say you concentrate on planetary observing or have taken up astrophotography, you might happily consider paying tens of thousands of dollars for the best equatorial mount on the planet. But to start out with, equatorial mounts are simply awful. They're difficult to set up, difficult to use, and the cheap ones are shakier than a leaf in a breeze.

Equatorial mounts are not just difficult to use, they're difficult to even comprehend at first. Simply trying to figure out how to orient the thing has killed the enthusiasm of many would-be astronomers.

So don't get an equatorially mounted telescope until you've



◀ **REALISTIC EXPECTATIONS** Saturn will look dim and blurry at  $400\times$  in a 70-mm refractor. A more modest  $200\times$  in a better telescope will produce a much more pleasing image.

been in the hobby awhile. Or never: Most observers don't require an equatorial tracking mount.

Altitude-Azimuth (alt-az) mounts are the way to go. For refractors, that means a solid mount on a steady tripod that lets you tilt the scope up and down and swivel it left and right. The scope should move smoothly, and it should stop when you stop pushing without bouncing back and without wiggling. If you tap the end of the telescope tube and it takes more than 3 or 4 seconds to settle down, you don't want that mount.

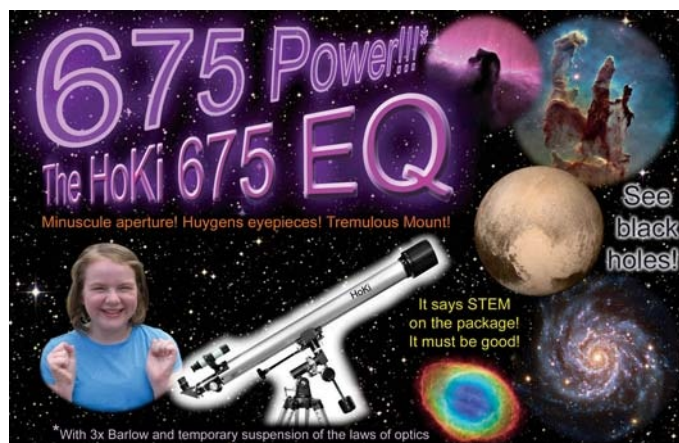
For reflectors, the Dobsonian mount is the way to go (with one exception: the Orion StarBlast mentioned below). It's basically a cannon mount, and it works like a dream. It's stable, smooth, and intuitive. When John Dobson introduced this mount to the astronomical world back in the 1970s, he made this hobby truly

accessible for the first time. See my column on page 72 on how to use Dobson's design to breathe new life into a poorly mounted hobby killer.

## Computerized Mounts

More and more lately you'll find hobby killers that have been computerized. The computer itself doesn't necessarily make it a hobby killer, although it can if the mount is a piece of junk, which most of the truly low-end ones are. It's just that putting a lousy little scope on a computerized mount doesn't make the scope perform any better.

▼ **EMPTY PROMISES** Ads can be deceptive. Don't be fooled by outrageous marketing claims!







**KEEP IT SIMPLE** An equatorially mounted telescope is a poor choice for a beginner.



**LIMITED USE** A 60-mm aperture is too small to provide a good view of much more than the Moon and bright open clusters like M45, the Pleiades.



“No knowledge necessary!” the ads will say. Aside from the fact that most of us get into astronomy to learn stuff, that’s seldom true anyway. With a low-end Go To scope (which is what the computerized ones are called), you’re likely to learn quite a bit of computer debugging and maybe even mechanical repair skills before you even get your first look through one. Seriously, I have seen people spend their entire night fiddling with the electronics, trying in vain to get the computer to work properly, and never once getting to look at anything in the sky.

On the other hand, a good computerized mount can be an amazing experience. Several manufacturers now build systems that recognize the star field when you power them on and reliably know where to go when you tell them what you want to look at. It’s just that these good systems cost a fair amount of money, and you’re unlikely to get a good one at a beginner’s-scope price.

### Recommendations

There are too many awful scopes out there to name them all. But I can happily name some good ones. Over the years, I’ve narrowed it down to three I can endorse without reservation:

Since you get more bang for your buck with mirrors, I recommend that your first scope be a reflector. The Orion 4.5 StarBlast Astro Reflector Telescope is a good place to start. It’s

easy to carry, easy to set up, and easy to use. The Astronomical League and many individual astronomy clubs give these to libraries to loan out to patrons, and the scopes provide great views and survive a lot of use.

If you have a little more money and don’t mind a bigger package, go for a 6” or 8” Dobsonian. I like the SkyQuest or SkyLine lines, also from Orion, but other manufacturers make good Dobs, too — Meade’s LightBridge series telescopes are worth checking out. I recommend a 6” as a good grab-and-go scope that you won’t outgrow right away. If you’ve got enough muscle to carry something a bit larger, get the 8” and it’ll last you a lifetime. With the Dobs, get a 10-mm Plössl eyepiece to go with the 25-mm that often comes with it.

There are undoubtedly other good beginners’ scopes out there. But there’s a lot of dreck, too. Pay attention, and try to avoid buying something that you’ll never use. If you want to get into astronomy, make sure you get a hobby *starter*, not a hobby killer.

■ Contributing Editor **JERRY OLTION** started with a hobby killer, but fortunately his astronomy club helped nurse his interest back to health.

Special thanks to Junia Clark for posing for the photographs.