

AN ASTIGMATISM CORRECTOR FOR VISUAL OBSERVERS
(Or, "do I have to wear my glasses when looking through my telescope?")

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The question "should I wear my glasses?" comes up pretty regularly at public viewing sessions and on the sci.astro.amateur Internet Newsgroup. The standard answer is that if you have pure near- or far-sightedness, then you can compensate by adjusting the telescope's focus. However, for those of us with severe astigmatism, no amount of adjustment of the telescope can compensate, and as a result, we can't get pinpoint star images.

"So," you ask, "why don't you just keep your glasses on when you observe through your telescope?" Good question. Plenty of folks do just that. However, I've always found it uncomfortable and a bit aggravating. First, some eyepieces don't have enough eye relief to permit comfortable viewing while wearing glasses, especially the higher power (shorter focal length) ones.

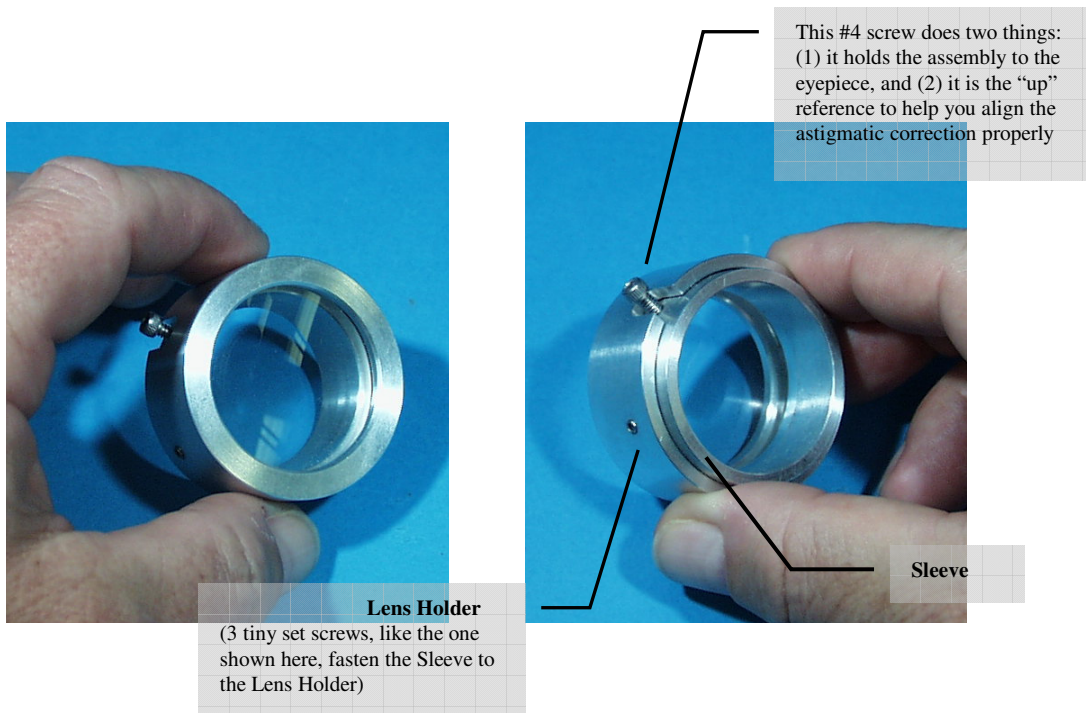
Second, since eyeglasses keep your eyes quite a distance from the eyepiece, it's hard to protect yourself from stray light (even stray starlight) scattered into your eye. This can be a very big deal when you're tracking down some 13th magnitude fuzzy glow.

Third, and most aggravating to me, is the difficulty of keeping my eye comfortably at the pupil of the eyepiece when I'm wearing glasses. It's amazing how much subtle tactile information you get from the way your eyebrow and eyelashes touch the eyepiece, to help keep you in the right spot, centered on the eye lens and not too close or too far away. With glasses on, the way you know that you're too close is that you hear a "clink", and the scope bounces every time your glasses hit the eyepiece.

Conventional solutions to these problems involve compromises. You can, of course, simply keep your glasses on, and avoid using short focal length eyepieces. Or you can shell out big bucks for a set of those new long-eye-relief eyepieces which have hit the market. Or, since a smaller exit pupil will help improve the image quality of your eye, you can use a smaller aperture telescope, which will give you a smaller exit pupil (when used at the same magnification). But who would want a SMALLER telescope? Or you can build a little astigmatism corrector for your eyepieces, which is what I did.

The concept is trivial: suppose you took the lens off of your glasses, and attached it right to your eyepiece. Then you wouldn't need your glasses because the eyepiece would correct your astigmatism (and your nearsightedness, too). You could move your eye comfortably right up into the exit pupil of the eyepiece. Your eye would still be a little farther away from the eyepiece than before (because of the thickness of the extra piece of glass), but not by much; certainly a lot less than with your spectacles on.

The pictures below show the assembly which I had a local machinist make for me:



The assembly consists of a Lens Holder, and a Sleeve that keeps the lens in place. The ID of the Sleeve loosely fits over the OD of my eyepieces. After the lens is installed in the Lens Holder (and secured with a small drop of glue), the Sleeve is locked in with three tiny set-screws. The whole assembly slips over the eyepiece, with the locking screw indicating “up” (the correct orientation of the astigmatism corrector lens), and the locking screw can be lightly tightened for a firm fit on the eyepiece.

The only critical dimension is the ID of the sleeve, since this is what must fit over the eyepiece – not too loose, not too tight. I measured all of my eyepieces, and set the ID of the sleeve just a 32nd inch larger than the largest eyepiece (i.e. a loose “slip fit”).

The machine shop who did the work for me was Longdon Precision Products (in Santa Ana), for a price of \$82 (for the 1.25” eyepiece version), and \$90 (for the 2” eyepiece version). The material is aluminum, with a finished wall thickness of 0.1 inch. [Note: this was over 5 years ago; so prices may have changed, and I don’t know if he’s still in business, but this is a simple job for any capable machinist].

The little set screws (socket head 4-40 set screws) might not be available at your local hardware store. Wright Hardware (in Costa Mesa) probably has them. If not, then GSA Hardware (on Pacific coast Highway in a pretty seedy part of Long Beach, near the Long Beach Freeway) has the west coast’s largest selection of fasteners, of all types.

I got my corrector lenses at one of the “quick service” lens maker outlets that are pretty common in southern California. This was a little trickier than I had originally thought it would be. Eyeglass lenses can only be dispensed with a prescription, of course, so make sure you have a copy of yours – preferably a current one, since I think they expire, and the optician may not be willing to make a lens to match an old prescription. Take the completed machined parts to the optician, so that he can size the lens to fit it exactly. You want the edge ground round, to match your holder, with the optical axis centered on the lens, and a scribe mark indicating the “top” of the lens. All this is standard stuff, and a good optician should have no trouble doing it.

There does seem to be some inconsistency in opticians’ willingness to do this sort of job. I suspect that there might be laws... One place I went to a few years ago was quite happy to turn out the lens while I waited, no questions asked. This was a privately-owned one-man shop. Later, (for a new prescription), I went to one of the big “eyeglasses in an hour” outlets, and the manager flatly refused to grind a lens to match my assembly, all the while shaking his head and

mumbling about regulations and policies. But a different large outlet was happy to do the job, and charged me exactly 1/2 the price they normally charge for a pair of regular glasses.

Wherever you go, be sure to talk directly to the lab manager or head technician, to explain what you're up to, and show him how the whole assembly will work. I left the aluminum mount with him for a few days, so that he could ensure a proper fit of the lens. This enabled him to do some fancy edge grinding of the lens, to match my holder, at no extra charge.

This "astigmatism corrector" lens assembly is one of the most useful accessories in my stargazing kit!

