

THE HYPONIC OBSERVER



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Mini-RMSS Proves Successful !

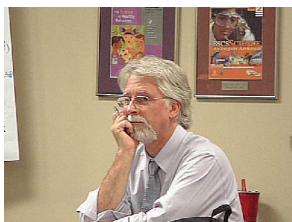


Splendid skies in mid September were enjoyed by the attendees of the first “Mini-RMSS”.

Last month's Meeting, had two speakers, Steve Rothstein (from Science First) and our own Scott.



Steve told us about the plans of his organization to build a Science Center in Colorado Springs. Those plans would include a planetarium.



Scott gave us a look at the origins of star names, and why they are so varied and notoriously confusing.

Mrs. Minerva's Cat Caught in a Tree; or how I came to love collimation

Telescope's (any make or model) will all need some kind of collimating of the optical system. I have chosen my words carefully here. Had I said, "Telescope's (any make or model) will all need some alignment.", I would have to write an entirely different column. Some telescopes may be in perfect alignment, yet their optical system can be significantly out of collimation.

SCT's (Schmidt Cassegrain Telescopes) are notorious for this. The short mechanical tube may be "square" and the optical elements may all be attached in perfect mechanical alignment; yet the optical performance can be less than optimal dramatically. While every piece of the OTA (Optical Tube Assembly) may be able to deliver its intended and designed best performance, the final image will be a confused ball of dancing light when "best" focus is attained (if possible).

How can this be possible? SCT's (really a misnomer -but that's another column) are sensitive

to a very small error of position in any of several possible dimensions between the primary and secondary mirrors. First, the very combination of the two mirrors with respect to the distance between them is of prime importance. Secondly, the adjustment of the primary mirror with respect to the center of the secondary mirror is critical. And last, but certainly not least, the plane of the secondary mirror disk (with respect to the centerline, which stretches from the center of the secondary mirror to the center of the primary mirror) must be orthogonal. If any (or a combination) of these conditions do not exist; then your final image will be distorted by the optical elements.

There's a lot of possible places for error's to show up. Take a look at each item:

1. The primary mirror must be separated by the exact distance computed by the designer, or perfect focus will never occur. But you say, "Why is this so important if the company that built the telescope gave me a focusing knob

which moves the primary mirror?”. Exactly. They want you to find and set the primary mirror to the distance which their designer computed for the final figures on the two mirrors. Do you ever find it? You probably get pretty close. That distance depends on a lot more than you might think. The temperature of the air, the shape of the two mirrors (as they adjust to temperature changes), the precision of the screw which pushes or pulls your primary mirror, etc. In addition, this adjustment may not leave your primary mirror pointing exactly in the correct collimation for item number 2.

2. If your mirror tends to have serious “slop” when the focusing knob is adjusted, your primary mirror may not be facing the secondary mirror squarely on (orthogonal). If you watch the image as you adjust the focusing knob (who doesn’t?) and you notice that the image “travels” or “walks” to another point in the field of view, then your primary mirror did not take the trip without some resistance, did it? Can this be good? No. Can it be avoided? Yes. Use the focusing knob to find the approximate zone where many of your eyepieces work then pour epoxy over the focusing mechanism. Seriously, that knob should be augmented with a focusing device at the eyepiece end of your optical train. That’s where any differences of mechanical distance for specific

eyepieces should be dealt with. The company that built your telescope will gladly sell you any number of accessories to make this happen. Short of dismantling your OTA, and epoxying the primary mirror into one position, this is the next best solution.

No serious astro-photographer uses the basic mirror-moving focus knob to get nice pictures. Think about it.

3. Now that the first two items have been dealt with, the final piece of the puzzle will be your next challenge. The manufacturer does a rough setting of the secondary mirror at the shop when the telescope comes off the assembly line. Nice comfortable environment, stable temperature conditions. Everyone handling the telescope has worn gloves and treated it with TLC (tender loving care). Adjustment of the three (3) collimation screws on the secondary mirror were made, and the OTA (strapped into a “saddle” on the workbench) was “sighted” onto a distant “target” a few hundred feet away from the workbench. Again, pretty close, and accurate for the time being. Now the telescope is attached to the fork (and another mechanical collimation of the fork and the OTA is performed). Quality assurance signs the card and the telescope is sent to you via your requested courier. The

box it comes in does a fair job of protecting the adjustments performed by the factory (despite the courier's haste to get it to your door). You put it to the test the very night that it arrives (we can all dream - right?). It's perfect! A year later, after RMSS, and many star parties traveling in the back of your truck, the picture has changed. While looking at Vega, the out of focus black hole (caused by the secondary mirror) is almost touching one side of the bright circle surrounding the black hole. What has changed? Those three little screws holding that massive three inch secondary have come loose. Get out the tools- lets fix this thing!

Ok, slow down. Have you ever done this before? No. Does it have to be done? Yes. Is there an "easy" way to do this? Well, not the first time, but like a lot of things, it gets easier the more often you do it.

Get a friend to help. Preferably one who has done this adjustment (successfully) many times. It is possible to do this by yourself (after all there's only one guy doing it at the factory - poor guy!). But you really can't believe how much trouble and serious damage you can do to your telescope if you don't know what to expect, and you go beyond the limits of the equipment.

First of all, NEVER, I repeat, NEVER remove any of the screws from the secondary unless you are immediately

replacing them with another screw (IMMEDIATELY means before you even think about touching another of the other two screws).

You may have seen a product called "Bob's Knobs"; this product replaces the three screws with screws which can be turned using only your fingers (no tools required). This works nicely, but puts the new possibility that someone at a star party may make this adjustment for you while you are away from your scope. My point here is that the instructions from "Bob's Knobs" explicitly warn of the dangers involved when removing these screws and that one-at-a-time is essential.

The real joy and beauty of this project is that you often get to do this in a hostile environment (unlike the factory guy). The weather will be less than comfortable, and it will most certainly be windy. Putting this all in the "Don't Care" column, we press on.

First, you need to realise that when you move one of the three screws (any one) the image of the out-of-focus star will move in the field of view (FOV).

Note: the star you chose can be any fairly bright star, but Polaris does not move and your telescope drive does not need to be draining your battery when you use Polaris.

Also, the star image may be inside or outside of the focal plane. Just make it large enough to see the black spot, but small enough that it stays bright and has contrast.

Why does the star move out of the FOV when I make an adjustment? Remember when you adjusted the original focusing knob (for the very last time - right?)? Same thing, you are changing the physical orientation between the primary mirror and the secondary. So what? Well, when you go back to the eyepiece, the target that you so carefully placed in the center of your FOV, has disappeared @#&!

How can anyone deal with this madness? Simply put someones' eye at the eyepiece while you (or that friend) makes the adjustment. Another option is to install a camera in the eyepiece, and watch a monitor while you make the turn. Before the image leaves the FOV, simply move the entire telescope to return the image to the center of the FOV.

Ok, which screw? This gets interesting. I use the method handed down by astronomers of old...use an educated guess. Looking at the black hole in the center of the out of focus star image; attempt to determine where it comes closest to touching the bright ring surrounding it.

Hint: the black hole can be exaggerated greatly by making a cardboard or felt ring that almost reaches the inside ridge of the telescope tube (ie a "mask"). By increasing the diameter of the secondary blockage, any deviation of the black spot from being concentric will be immediately evident!

Once you decide which side of the image is being "pinched", make a mental image of which side of the tube it is closest to, and find the screw which is OPPOSITE of that point. So, why this screw? That screw will have the most influence on the adjustment. The point may lie between two of the screws. True! Pick one. You will probably be adjusting the other screw very soon.

How much do I need to turn it and in which direction? Fair question, but its like brain surgery - you won't know until to see it. Use some caution, and as you SLOWLY turn the screw ask your assistant if the black spot is moving such that it no longer "pinches" the bright ring, or if it is getting worse. Obvious reaction to the reply should then be taken. Small turns can make BIG changes! Sneak up on it, and if your first single screw fails to cure the image try that second screw that you identified before. (Oops, you forgot which one was the other screw!) Go back to the eyepiece and determine where the bright ring is being "pinched" and then find the corresponding OPPOSITE screw as before.

Fun huh?! Once your out-of-focus star image has been adjusted making the black spot as concentric with the bright ring as possible; adjust the eyepiece focuser, and the star should become a singular spot surrounded by diffraction rings.

A steady atmosphere (no “waves” in the bright ring of the out of focus image), and your highest power eyepiece (shortest focal length) should show diffraction rings. Or the image of the star viewed through a mask with multiple openings (three; one for each screw?) should converge to one single image.

Member Photos -

Cindy took this picture of Jupiter and the Pleiades using a Sony DSC-V1 camera set to infinity. And she used a 30 second exposure. The camera was riding on a Mizar equatorial mount.



These are some of her first astrophotos. Well done Cindy!



Ron sent this in this shot of M13 (in Hercules). He uses a Cannon 50D and says, "The live view really helps me set the focusing."



Star Party at the Lake George Boy Scout camp.



Despite a cloudy night, the Scouts enjoyed a view of our moon, and Jupiter. Some of them even tried their hand at taking some lunar pictures. Questions by the thousands, and even a few answers too!

