Newsletter of the Brazos Valley Astronomy Club

THE OBSERVER

Volume 1 Issue 1 **Rainy Summer Edition** **July 8, 2007**

IN THIS ISSUE

From the Editor's Desk

Howdy folks!! Welcome to the first ever edition of *The Observer*, our very own newsletter covering the many facets that make the Brazos Valley Astronomy Club such a fun family to belong to. I am honored to be chosen as your editor and to be entrusted with the important task of bringing this publication to life and delivering the finest club newsletter every quarter that I can. Please join me in congratulating and thanking the authors, **Judy Culver, Mark Spearman, Don Bray and Kelsey Golden**, who have contributed such thought provoking and timely articles for this edition of your newsletter. I've even included some dazzling astrophotos in this issue, and I want to thank the imagers who graciously allowed me to utilize their hard earned images for this purpose. Well, as you all know, we've had a record rainy and cloudy summer thus far. It has severely restricted our observing activities so please join me in praying for a speedy return to clear and steady nights. If not, I'm sure like me, you'll want to curl up with your copy of *The Observer*. And now, on to the main show!!

Anjal Sharma.

From the Oval Office

I am very happy to be writing this for our very first newsletter. Hopefully it will be the first of many! The Brazos Valley Astronomy Club has been meeting monthly since our first formative meeting in January of 2006. Thanks to the efforts of many, our meetings have been very interesting and informative. We are fortunate to have such a group of extremely bright and talented members.

Although we have been around for 17 months we still have a lot of work to do to get better organized. I would like to encourage everyone to look at the By-Laws that are posted in the files section of our Brazos Astro Yahoo Group. We need to have a final draft for our July 20, 2007 meeting. Your input is valuable! Please send any changes that you feel would help our club to me at jculver@yahoo.com.

Brent Maxwell has volunteered to help with a club logo. I'm checking into getting some window stickers made up to help advertise our club. We can also use the logo on T-shirts and club correspondence. Thanks, Brent!

On behalf of the Brazos Valley Astronomy Club, I would like to thank some very special people who have made our organization possible: **Dennis Utley** , who is responsible for getting all of us together to form the BVAC; **Bob Brick**, Vice-President of BVAC; **Will Sager**, Secretary/Treasurer; and **Anjal Sharma**, Newsletter Editor. Special thanks go out to **Don Carona** for allowing us to use the TAMU Observatory and **Mark Spearman** for the use of his private observatory. **Dennis**, **Will**, **Mark**, **Anjal**, and **Kris Byboth** have given some spectacular presentations for our meetings. We really appreciate all of your hard work!

If you have any suggestions for future meetings or would like to give a presentation, please contact me. Hope to see you all at our next meeting!

Judy Culver.
(BVAC President)

BVAC Information

Officials

President – Judy Culver
Vice President – Bob Brick
Secretary/Treasurer – Will Sager
Outreach & Events Organizer – Dennis Utley
Webmaster/Yahoo E-group Moderator – Mark Spearman
Observatory Coordinator – Don Carona
Newsletter Editor – Anjal C. Sharma

Advisory Committee

Don Bray, Joe Powell, Kelsey Golden, Harvey Cobb and Kirk Richardson.

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BVAC Website

http://tech.groups.yahoo.com/group/brazosastro/

EVENTS AND ACTIVITIES

BVAC Monthly meetings are held on the 3rd Friday of the month. Locations vary, but usually they are held at Blinn College, Texas A&M Observatory or at "The Lodge" inside Gander Mtn. off Hwy. 6. Please remember to check the yahoo e-group site for up to date meeting reminders and locations.

My Favorite Celestial Object - Saturn

Don E. Bray, Ph.D.

Saturn provides contrasts and image opportunities for both the amateur astronomer, the astrophotographer and one who is simply curious about the creation of the universe. Given that the Big Bang is the source of all that we see (as well as "other universes"), it is rewarding to be able to view and photograph items in our universe that reveal this process. A physicist was once asked, "What existed before the Big Bang?" His response was that while he was not sure, he did feel that the Laws of Physics were there. Simple photographs of Saturn (**Figure 1**) support the presence of the laws of physics during the formation of the universe that we see.

Figure 1: Saturn imaged with an S2IS camera through an 8 inch Newtonian. (Image: Don E. Bray)

Even though the rings are the most striking feature, the mass of the disk is what sets the foundation for the planet. Hydrogen is the dominant chemical element in both of the gas planets, Jupiter and Saturn. While Saturn is smaller than Jupiter (it occupies 60 percent of the volume of Jupiter), it has only a third of the mass and has a density of seventy percent that of water. Hence, it would float if dropped in a very large tub of water. The atmospheres that we see in the two are similar. In Saturn the hazy brown clouds are composed mostly of hydrogen and helium and methane with ammonia, hydrogen sulfide and water. They form circulation bands, which vary about the latitude and are symmetric about the equator. The patterns of the atmospheric bands in the gas planets are determined by dynamic interaction between the surface of the planet and the atmosphere. Storms occur that disrupt the pattern, but the overall symmetry generally holds. [http://www.britannica.com/eb/article-54279].

The gravitational forces described by Sir Isaac Newton in 1687 largely determine the shape and position of the planets. It is not surprising that Newton the mathematician followed Galileo the experimentalist by just over 50 years. Newton made contributions to telescope technology and mathematical analysis to support understanding of the universe. Newton's explanation stated "any particle of matter in the universe attracts any other with a force varying directly as the product of the masses and inversely as the square of the distance between them. In symbols, the magnitude of the attractive force *F* is equal to *G* (the gravitational constant, a number the size of which depends on the system of units used and which is a universal constant) multiplied by the product of the masses (*m*1 and *m*2) and divided by the square of the distance *R*: $F = G(m_1 m_2)/R^2$. [http://www.britannica.com/eb/article-9055622]

In the formation of the planets from the early chaos, like and dissimilar particles played the gravitational attraction game until a finite number of large masses (planets) was formed. Newton's Laws of Motion describe these events where a force (F) is required to maintain a particle of mass m at acceleration a. Gravitational attraction between the masses (as described above) is the source of the acceleration. [http://www.britannica.com/eb/article-9055622.]

Saturn at one time in its early life probably was shaped like a ball, a perfect sphere. At a time when the mixture was somewhat homogeneous the gravitational attraction amongst particles would be uniform in all directions. Hence, as they settled into an equilibrium state in a weightless environment, we should see the uniform ball as demonstrated with liquids from space by the astronauts. Saturn like other planets spins on its axis. This spin puts a centrifuge effect on the planet that redistributes the masses [http://www.britannica.com/eb/article-9022102]. The centrifugal force (F) was described by Newton to be $F = mn^2 / R$; where m is the mass, R the radius and n the number of revolutions per second. Thus, particles of the same mass close to the spin axis would have a larger centrifugal force than particles further away. Particles with a higher mass at the same radius (and speed) would have a larger centrifugal force than the lower mass particles. For equilibrium, the outward acting centrifugal force equals to the inward gravitational force between the particles. In a centrifuge filled with a uniform suspension of particles having different densities, the more dense particles would move outward from the spin axis displacing the less dense particles, forcing them back toward the axis.

The bulging shape of Saturn is likely a result of a redistribution of the planet mass based on the centrifugal force and gravitational attraction. Since the planet is a gas, and not a solid, it can easily conform to an equilibrium shape. The approximate aspect ratio measured for the planet in the photo is 0.86.

The photograph shows clearly the bright middle ring B and the fainter outer ring A. The faint inner ring C is hard to see. Results from the Cassini probe [http://www.physorg.com/news4223.html] found that the rings were a very complex structure. The source of the ring material is unclear, but there is some thought that they might have come from space loose particles attracted to Saturn by gravity. Solid particles initially captured within the gas planet also could be purged by the centrifugal force and find equilibrium in the rings.
The Cassini results found that the rings are hundreds of kilometers wide and contain material of significantly varying densities. Near to the planet, ring C has an abundance of particles less than 5 cm in diameter. Ring B is a thick 5,000 km wide ring with particle densities of approximately 4 times the density of A and also 20 times the density of C. In ring B particles less than 5 cm in diameter are scarce. The larges observed particles are several meters in diameter. Clearly, the force balance previously discussed plays a role in the organization of the rings.

Equipment supporting my backyard observatory consists of the following:

(A) Orion 8-inch reflector telescope with a Skyview Pro EQ tripod, (B) 2X Barlow lens, (C) ScopeTronix MaxView 40 eyepiece with STAK96 attachment kit for fitting the camera to the telescope, (D) Canon S2IS digital camera, (E) Laptop computer for viewing the image for alignment and focusing, (F) Lynkeos software for stacking the images, (G) Photoshop CS for image processing.

The image of Saturn shown in **Figure 1** was shot on 04 March 2007 using ISO 400, 1/15, 4.5 with a stack of 43 of 67 images.

The website for the Brazos Valley Astronomy Club has images of Saturn by Mark Spearman and Anjal Sharma which are certainly superior to what I have shown here since they show more detail. These should be viewed for more understanding of the planet.

User Review – Orion Skyview Pro Equatorial Mount

Kelsey Golden

The Sky View Pro (SVP) is a small equatorial style mount distributed by Orion Telescopes. It comes in three different versions: Manual, Digital Setting Circle (Intelliscope), and GOTO. Retail prices for the mount range from $369 to $819. I had the recent pleasure of owning the “manual” version of the SVP and it served my general observing purposes quite well. **Figure 1** is a stock picture showing the manual SVP mount.

Figure 1: Orion SVP mount.

Benefits:

I purchased the SVP four years ago along with an Orion 8” f/4.9 Newtonian OTA. In Addition, I had two 7 pound weights bringing the total load on the mount to 30 pounds. Despite the fact that the weight load was 10 pounds over the manufacturer’s recommendation, the mount performed quite well.

The Latitude Adjustment L-Bolts on the SVP are conveniently placed. Unlike other mounts that I’ve used such as the CG-5, there is no obstruction such as the right ascension drive that hinders altitude adjustment (**Figure 2**). I also found the mount to be extremely portable and easy to set up. Combined with a duffel style case also distributed by Orion, I could get this mount set up, pre-polar aligned and ready for the OTA in a couple of minutes.

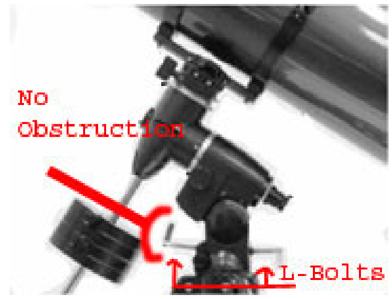


Figure 2: Altitude adjustment bolts.

The Manual Setting Circles on the mount while not perfect were large enough to provide some accuracy when looking for objects via setting circle. I would often only calibrate the Declination circle and slew to the Dec coordinates of the object I was looking for. I would then gaze through my largest eyepiece as I slewed in the appropriate Right Ascension direction until the object often flawlessly appeared in the field of view.

Another important benefit to the SVP that I didn't notice until I upgraded to my new Celestron CG-5 GOTO Mount was that the tracking error on the SVP was far lower than that on the CG-5. If I polar aligned carefully using nothing more than Orion's Polar Alignment Scope, I could often snap up to 5 minute exposures on my Digital Rebel with very little if any stellar drift! When I tried to take the same pictures through the same scope on the CG-5, the longest exposure I could take was about 30 seconds!

Drawbacks:

A major issue that I had with my SVP mount was that the Placement of the Declination motor was poorly designed. Unlike the Right Ascension motor which was well covered and protected, the Declination motor lacked proper housing which caused the entire delicate motor assembly to be subjected to my own clumsy fumbling in the dark. In fact, one evening as I was taking down my OTA, I accidentally brushed part of the Declination Motor Assembly with my scope. This accident caused part of the circuit board attached to the motor to break (**Figure 3**). I never got the motor to work properly after that incident and ended up replacing the motor assembly with a makeshift manual control knob.

Figure 2: Declination motor assembly.

The other issue that I had with the mount was that several of the plastic parts of the mount came off quite easily. One such piece was the latitude indicator (**Figure 4**). This round piece of plastic came off through normal wear and tear on the mount. I reattached it with superglue after polar aligning at a known latitude but the fact that it came off in the first place was nonetheless annoying. The other piece that fell off often was the rear polar alignment scope cover. While not a tragedy, I can see how the cover would've been easily lost in the dark were I not aware of it falling off. As a solution, I ended up preemptively taking the cover off and leaving it off during observing sessions.

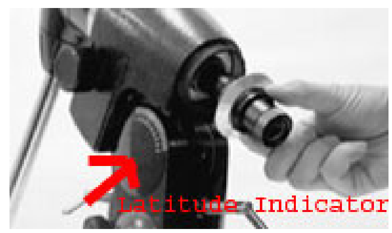


Figure 3: Latitude indicator.

Recommendations:

Due to the low weight capacity (my 30 pounds was pushing it) and the lack of an auto-guide port, I would not recommend this mount for astrophotography. While the mount is available in a "GOTO" version for a hefty $819 brand new, it is quite expensive compared to some of the higher weight capacity "affordable" mounts such as Celestron's CG-5 which has an auto-guide port. I would also not recommend buying the Digital Setting Circle version of the mount because the assembly of the digital setting circles requires the permanent removal of the polar alignment scope making polar alignment all the more difficult. The ideal user of the Sky View Pro mount knows the night sky relatively well, has a small telescope weighing less than 20 pounds and desires a high degree of portability with very little setup/take down time.

Telescope Collimation – Greatest Strength or Weakest Link?

Anjal C. Sharma, Ph.D.

Collimation is the act of lining up the optical surfaces of the telescope in their correct positions in order to allow light to pass through the scope in the way in which it was intended. A well collimated telescope therefore would have perfectly aligned optical surfaces, such that the light cone passes completely through the focuser drawtube without being cut off prematurely. If the optical surfaces of the telescope are tilted out of whack (technical term) the outer portions of the light cone will hit the focuser drawtube and enter the eyepiece or camera at an angle not orthogonal to the sensing surface (your eye or the camera sensor). In

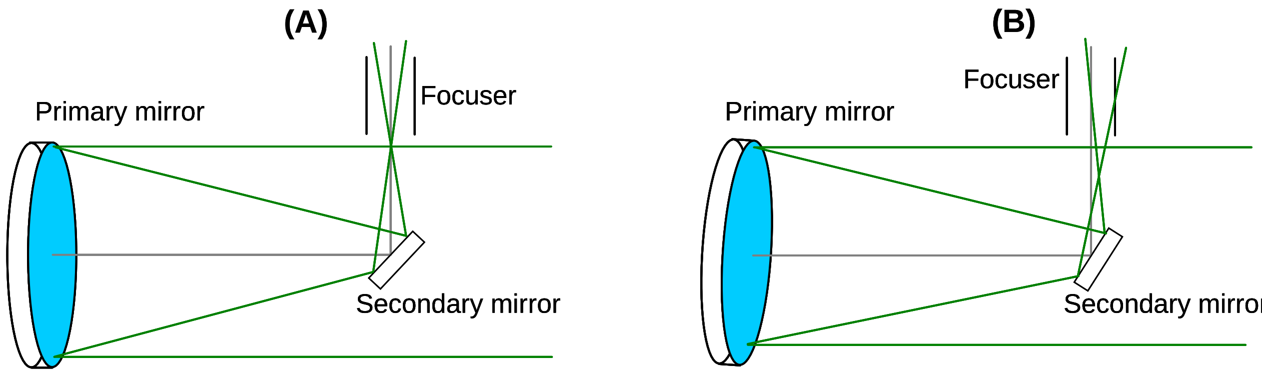


Figure 1: Schematic depiction of the concept of collimation. In **(A)** the optical axes of the scope (gray lines) and the light cone path (green lines) are matched perfectly such that the light exits the focuser without being cut off. This is a perfectly collimated scope. In **(B)** however, the scope is miscollimated, and the tilt of the primary mirror prevents the light cone from exiting the focuser without being cut-off.

this scenario, the telescope is said to be miscollimated. **Figure 1** schematically depicts the concept of collimation and shows that a miscollimated scope effectively performs like a much smaller aperture scope.

What's the big deal with collimation anyway? Is collimation really that important, that a whole newsletter article must be written about it? I believe the answer is a resounding YES, COLLIMATION IS REALLY THAT IMPORTANT! There is not a whole lot that you can do to correct inherent optical defects in the scope short of either selling it, or sending it back to the manufacturer for repair if it is even possible. But there is everything that you can do to ensure that the optics, flawed to some extent though they may be, perform at their peak every night. That everything is to check and perform collimation of the scope after the scope has reached thermal equilibrium with the surroundings (cool-down).

Take my Celestron C8 XLT Schmidt-Cassegrain scope, for example. The optics are well, far from perfect. The system is approximately diffraction limited (estimated at around $1/4^{th}$ λ ptv). The main mirror has a relatively rough surface, and it also has a slight turned down edge. There are two zonal defects in this system and the scope has a residual amount of astigmatism which may be a bit higher than other examples of the C8. These defects can be seen in the not so great star test that this scope provides (**Figure 2**). However, because I CRITICALLY and I mean CRITICALLY collimate this scope every observing or imaging

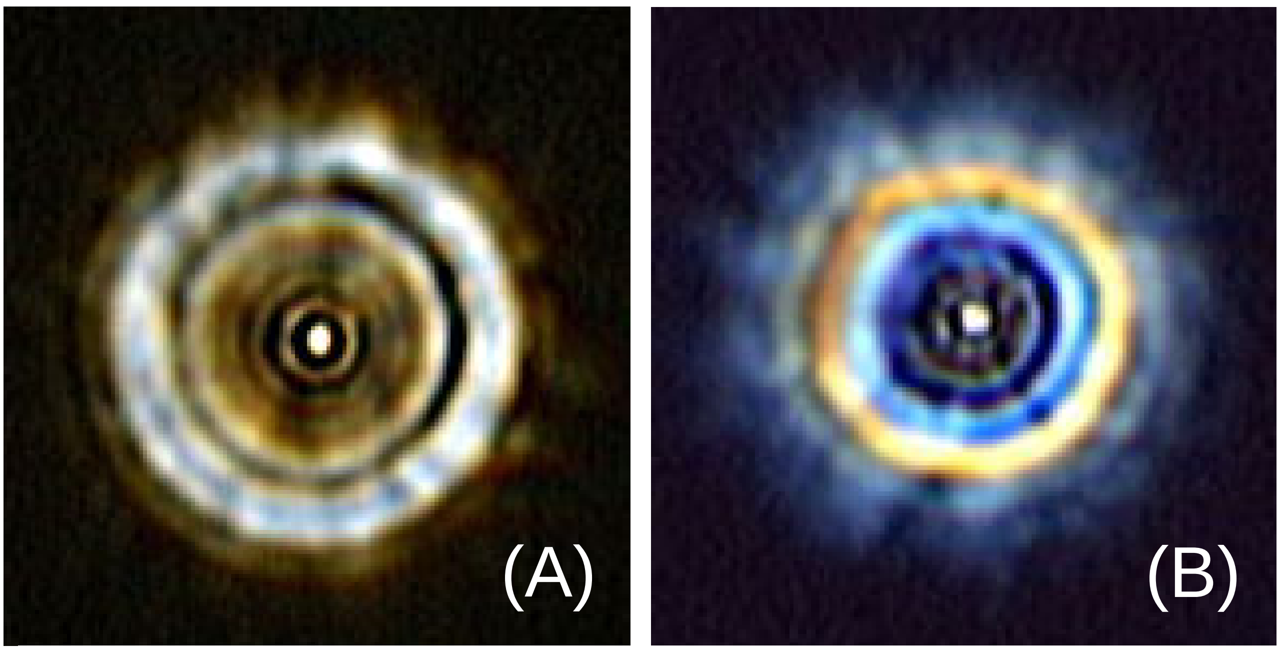


Figure 2: Star testing my C8 XLT Schmidt-Cassegrain on Vega. (A) inside focus and (B) outside focus. The scope is critically collimated since the central Airy Disc lies exactly in the center of the Fresnel rings. The Airy disc appears elongated upwards in (A) but sideways in (B), indicating astigmatism. The Fresnel ring pattern suggests undercorrection to about $1/4^{th}$ λ ptv (just barely diffraction limited). Zonal defects can also be discerned from the diffraction pattern. The striations or rays shooting out like the spokes of a wheel from the central Airy disc outwards show that the mirror is roughly polished.

session, it performs to the peak of its optically flawed capabilities. This is evident in some of the planetary images that this scope has provided as shown in **Figure 3**.

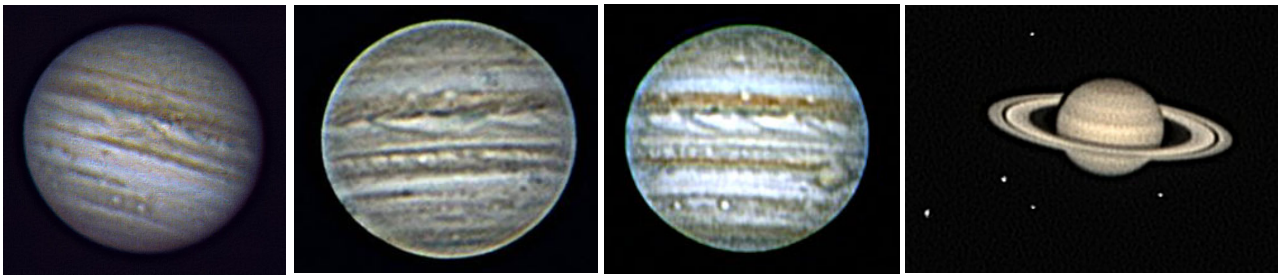


Figure 3: If the collimation is critically performed and the optics perfectly aligned, even my optically mediocre C8 can provide pleasing high resolution planetary images. Consistent collimation is king, and should always be done every time you observe or image. Needless to say, critical collimation will be your scope's greatest strength!! Conversely, poor collimation will negate the performance of even the best optical quality scopes and will therefore be the weakest link.

Note the level of detail visible in the images of Jupiter and Saturn taken on different nights, some not even in the same year. I consistently can get comparable or perhaps even superior images to what others have been able to capture using far more expensive and perhaps optically better examples of 8 - 10 inch scopes (vagaries of seeing and camera settings notwithstanding).

Still not convinced? Well check out what poor collimation can do to the images that the scope provides as seen in **Figure 4** (Images courtesy of T. Legault - http://legault.club.fr/collim.html).

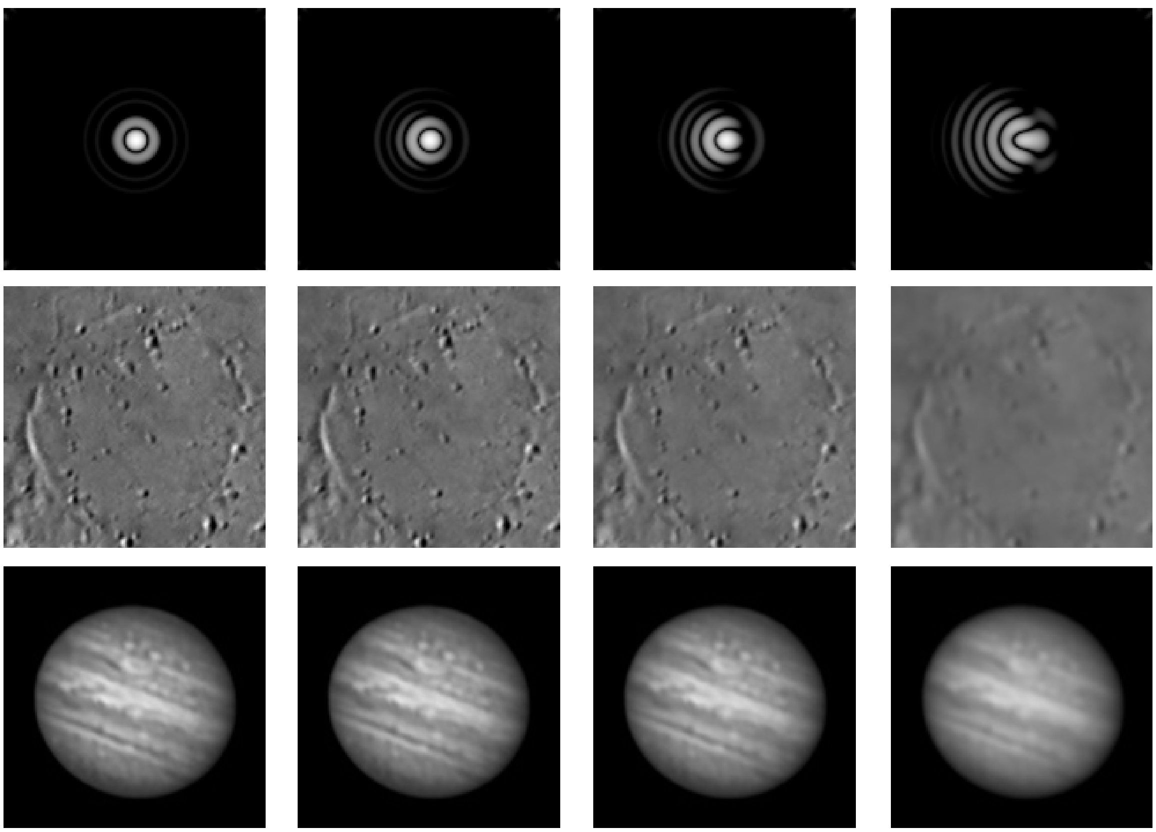


Figure 4: Effect of collimation on image quality for a 12 inch Newtonian. The second column shows ***very*** slight miscollimation (~ $1/7^{th}$ wave added spherical error), but it is enough to make the scope perform like it has ***an inch less*** of aperture. The last column shows severe miscollimation corresponding to a full wave of added spherical error. The scope now performs like it has ***a third*** its native aperture. No amount of image processing can bring out lost detail here.

The take home message here is very simple: **Collimate critically and collimate often**. It is the best way to get maximum performance and ensure full use of your scope's aperture. If you've never collimated your scope before, but would like to learn how to do so, please talk to me or any other club member experienced with collimating scope optics, and we'll get you started.

Polar Alignment – A Primer

Mark L. Spearman, Ph.D.

Polar alignment is one of those things that seems daunting to the beginner but can be easily understood and achieved with a little explanation. In this article I will attempt to de-mystify the procedure of accurately polar aligning your ***equatorial*** mount.

Different mounts. There are two basic mounts for astronomical telescopes: altitude-azimuth or *altazimuth* and *equatorial*. Dobsonians represent altazimuth mounts as do most camera and binocular mounts. These mounts get their name from the fact that their two axes move in altitude (up and down) and azimuth (sideways). Equatorial mounts, on the other hand, have one axis that moves parallel to the earth's axis and one that moves perpendicular to the first axis. This allows the mount to track a star by moving only one axis. The typical fork mount on most SCT (e.g., Meade LX series) telescopes is an inexpensive version of an equatorial mount. Most of the more precise mounts such as those made by Astro-Physics, Takahashi, and Paramount (Software Bisque) are the *German* equatorial mount.

The north celestial pole (NCP) and it's relation to circumpolar constellations. The north celestial pole (NCP) is the point in the northern sky around which stars appear to rotate every night. Circumpolar constellations are constellations which are always above the horizon and which can be utilized to easily locate the position of the north celestial pole. **Figure 1** depicts the concept of the NCP and how certain circumpolar constellations have stars which act to point out the position of the North Star (Polaris). For example, an arrow drawn through the two end stars in the big dipper, Dubhe (α-UMa) and Merak (β-UMa) points straight to Polaris. Similarly, an arrow which bisects the two middle stars in the "W" of Cassiopeia, Ruchbah (δ-Cass) and Shedir (α-Cass), and going through γ-Cass also points straight to Polaris. Once the North Star is located, it is a good jumping off point to accurately polar align your equatorial mount. In fact, if a line is drawn from Polaris (a-UMi) to Kochab (b-UMi) it almost bisects the NCP which lays around 44 arc-seconds from Polaris towards Kochab. Since Kochab like Polaris is a 2nd magnitude star, it can be easily discerned even in moderately light polluted skies, and can therefore be for a rough polar alignment.

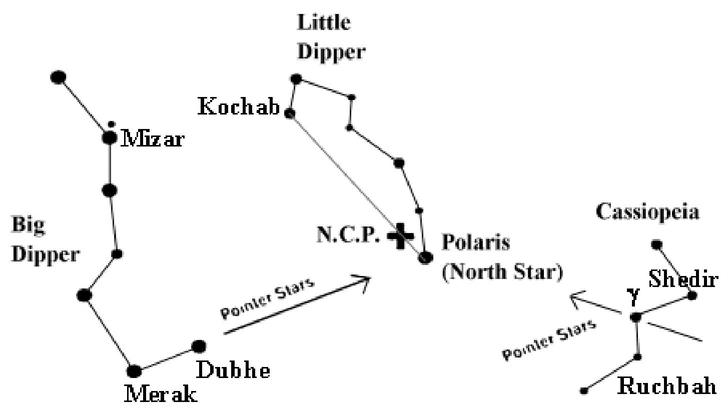


Figure 1: The pointer stars in the circumpolar constellations, Ursa Major, Ursa Minor and Cassiopeia may be used to locate Polaris and then the position of the NCP can be roughly estimated as lying along the line from Kochab to Polaris.

What is polar alignment? To be "polar aligned" means that one of the two perpendicular axes of the mount is parallel to the earth's axis (**Figure 2**). This means that the scope can track the motion of the stars by moving only one axis. If this motion is at a rate of one complete turn every 23 hours 56 minutes, a polar aligned scope will keep a star in the field all night. The other BIG benefit of being accurately polar aligned is that the object does not appear to rotate in the field of view and this is NECESSARY for long exposure deep sky astrophotography and HIGHLY desirable for short exposure planetary and lunar imaging at high magnifications. Altazimuth mounts, on the other hand, are typically not polar aligned. Here the two axes are vertical and horizontal. An altazimuth mount can be polar aligned using a "wedge" that tilts the azimuth axis to be parallel to the earth's axis. These mounts are great for visual use, but cannot be used for long exposure deep sky astrophotography.

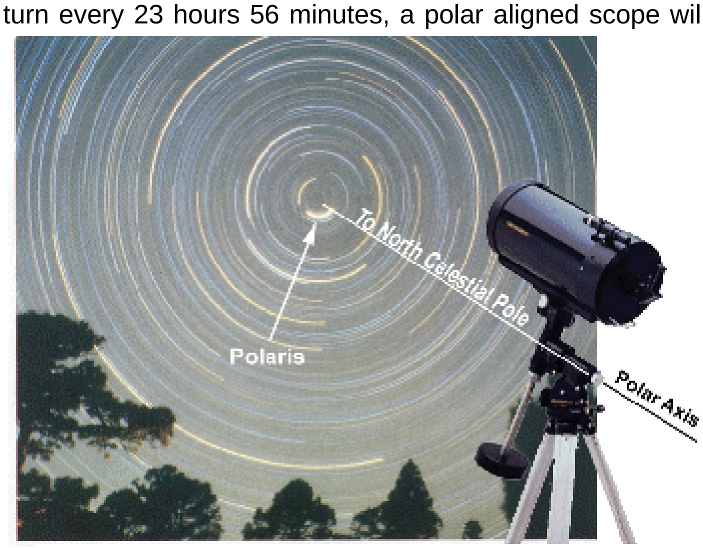


Figure 2: Polar alignment is the act of pointing your equatorial mount's polar axis to the NCP.

Getting aligned. To achieve polar alignment, the mount should be in a position that is set to 90^{o} North then move the mount so that it does, indeed, point to the North celestial pole (in the Southern hemisphere you align on the South celestial pole). For a fork mount, this means that the scope is parallel to the forks (pointing outward, not back at the base). For a German mount, the mount should have its counterweight as low as it can go with the scope pointing as high as it can. In both cases the mount should be roughly level. The next trick is finding the North celestial pole. A rough alignment can be done by pointing the telescope toward true North (not magnetic north) and then adjusting the elevation of the axis to match the latitude. Use a landmark that points north. My latitude in Wheelock is +30 54'. For College Station, it is somewhat less. This will get you in the ballpark and can be done in daylight. You can get a somewhat better alignment using the pole star, Polaris in Ursa Minor (it is at the end of the handle of the Little Dipper and it is the star that the "pointer" stars in the Big Dipper point to). For the visual observer with an equatorial mount, this is good enough. First level the mount and set the elevation of the polar axis to the latitude. Then with the mount in the north position, move the tripod until the scope is pointing at Polaris. **Figure 3** gives a better idea of what's involved in achieving this initial Polar alignment. Using my old Meade whose mount predates the LX series, I would first roughly point the scope toward North and then roughly level it by adjusting the tripod. I would then move the tube until it *felt* like it was parallel to the forks. One would think that one could use the setting circles but mine refused to stay on one place and I found that feeling is better than seeing. After it is dark enough to see Polaris, I would give a little kick to the end of the tripod legs until Polaris was in my Telrad. That would do it for keeping objects in view for as long as I cared to view them.

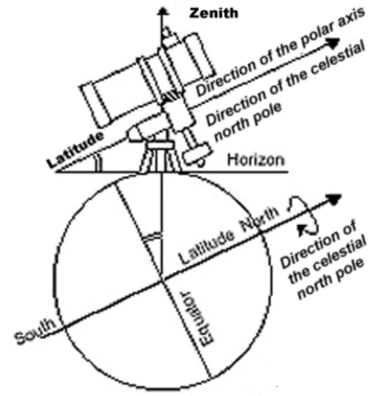


Figure 3: A polar aligned mount and its relationship to Latitude, North, South and the NCP.

Improving the alignment. For the visual observer, there is no need to go beyond a rough polar alignment. However, for the astrophotographer, excellent polar alignment is a must. Even for cameras that automatically send corrections to the mount by tracking on a guide star, good polar alignment makes for better images because it prevents drift in Declination which shows up on film or on CCD as trailed stars in the outer areas of the image frame. In this case, aligning on Polaris is not good enough. One way to improve is to use a "Polar Axis Finder." These are typically installed in the Right Ascension axis of a German equatorial mount and are composed of a small telescope, a reticle, and an illuminator. The reticle shows Polaris and other circumpolar stars. The idea is that once the stars are aligned to the reticle, the mount is polar aligned. This would work very well if the reticle and the scope is adjusted so that the reticle and the field of view are at the same scale. In other words, the stars must be the same angular distance from each other as indicated on the reticle. The reticle on my Losmandy G11 shows the stars significantly further apart than they appear in the little scope. From what I have read, this is a common problem with some scopes from the same supplier being well aligned and others not. However, it may be in the way the scope is designed. One must first focus the eyepiece to view the reticle clearly. Then one must screw the tube containing the objective in and out to focus the stars. If the spacing of the reticle to the eyepiece is off, the scale can be off. Nonetheless, after a great deal of playing with the scope from my Losmandy G11, I could never reconcile the placement of the three stars, the pole and the two guiding constellations (Ursa Major and Cassiopeia). I would be very interested to hear from others who have been able to match these.

The Declination Drift Method. The best way to achieve excellent polar alignment is to take advantage of the motion of the earth itself. The declination drift method uses two stars and a reticle eyepiece to monitor errors in guiding. This method takes a lot of patience and time the first time it is used but can be done much more quickly with practice. First, align the telescope roughly using one of the methods above. Then choose two stars, one near the Eastern horizon and one within ½ hour of the meridian (the imaginary line that goes through the pole and the zenith and represents the highest point of stars as they cross the sky). Both stars should be near the celestial equator (within 5^o declination). Any good star chart will show the celestial equator. Put in a reticle eyepiece that is around 100 X and then align the reticle to be parallel with right ascension and declination. Choose the star near the meridian first and center in the eyepiece. We are going to look for drift in declination, so ignore drift in right ascension. <u>If the star drifts South, the polar axis is too far East</u>. <u>If the star drifts North, it is too far West</u>. Adjust accordingly and re-center the star. Repeat until there is no drift after five minutes (or until you are tired of the process). Now move to a star that is about 20 degrees above the Eastern horizon and within 5 degrees of the celestial equator. Center the star. <u>If the star drifts South, the polar axis is too low</u>. <u>If the star drifts North, the polar axis is too high</u>. Adjust accordingly and repeat until there is little or no drift. Note if you cannot use the Eastern horizon a star on the Western horizon will suffice but the directions are reversed. Once you have finished the process, the polar alignment is very good. If your telescope is portable you may want to install a permanent marker for each tripod leg (I used spray paint on the driveway leaving a shadow of the leg positions) and place a permanent mark on the legs of the tripod indicating their height. Polar alignment can be a tedious process. But, with a little practice, you can do it quickly and have a good alignment every time.

ASTROPHOTOGRAPHS TAKEN BY BVAC MEMBERS


The Wanderers – Venus and Saturn

Photographer: Don E. Bray Equipment: Handheld Canon S2IS

The image on the left was taken in June 2007 and the image on the right was taken in early July 2007. This picture shows why the term "planets" which from the Latin means "wanderers" is so very accurate.

Venus and the Pleiades

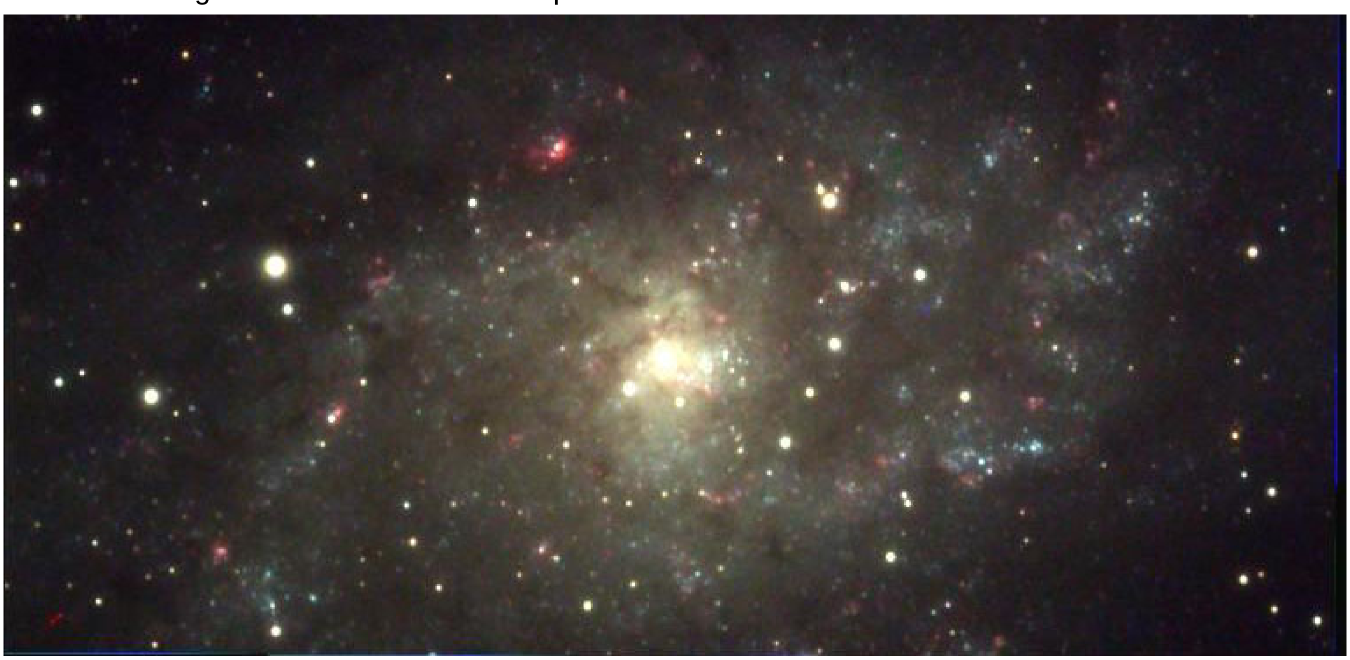
Photographer: Kelsey Golden Equipment: Piggybacked Digital Rebel on 8" (f/4.9) Orion Newtonian mounted on the Orion SVP with 55mm zoom lens at ISO 400, 30 Seconds

The seven sisters and the goddess of beauty are vying for your attention in this widefield panorama.

The Eagle Nebula (M16) – A Stellar Nursery

Photographer: Mark Spearman Equipment: Takahashi TOA130 5" triplet ortho apochromatic refractor riding on the Losmandy G-11. Image taken with the ST-7 CCD camera.

The eagle nebula is a close star birth factory full of neonatal stars, and giant light years long sheets of dust and gas. Stellar winds from the newborn stars create the fantastic "Pillars of creation" that give the nebula its recognizable and distinctive shape.



A Grand Design – The Triangulum Galaxy (M33)

Photographer: Mark Spearman Equipment: Takahashi TOA130 5" triplet ortho apochromatic refractor riding on the Losmandy G-11. Image taken with the ST-7 CCD camera.

The Triangulum galaxy (M33) is a neighboring grand design spiral galaxy. Stellar nurseries (red) and open clusters (blue) within the spiral arms have been captured in sharp detail in this superb image.

<u>The Horsehead (B33) and Flame Nebula Region in Orion</u>

Photographer: Anjal C. Sharma Equipment: Chrominance data is from a stack of several 2 to 4 minute exposures with the modified Digital Rebel and the Sky 90 on the ASGT. Luminance data is courtesy of J. Schedler using an ST-7XME and a ε-200 on an NJP.

The horsehead nebula (B33) is a dark globule of cold dust and gas which fortuitously lies in front of an H-alpha emission nebular region making it visible in a long exposure image. The Flame nebula is an H-alpha emission region close to the horsehead. The flame and horsehead nebular region is a small portion of the vast Orion Molecular Cloud.