1. VIEWING DIRECTIONS

In the metroplex area, most of our viewing is done either to the West, South, or East. Always start by looking to the West, since these objects will set first. Then move to the South, and finally to the East. Avoid looking over buildings because they give off heat and disturb the air. Objects below Polaris will be higher in the sky in a few months, so hold your viewing of these until then. Looking through a windowpane of your house won't give good results, but if you want to try it, try several areas of the glass, since some spots have less disortion than others. By the way, opening the window does little to help since the rush of hot or cold air greatly disturbs viewing. Finally, always look at the Moon last. Because of its brightness, your night vision will be destroyed for as long as an hour.

2. IMPROVING VIEWING CONDITIONS

When the sky is turbulent and the viewing or seeing conditions are bad, there is something you can do to improve things. It's called stopping down your telescope. Here's what you do. Make a cover for the objective lens of your telescope, and cut a smaller hole in it, effectively making the aperture of your scope smaller. If you have a refractor, cut the opening in the center of the cover. If you have a Newtonian reflector, or Schmidt-Cassegrain which has a central obstruction, cut the opening off to one side of the obstruction.....but make the opening as large as you can without the obstruction showing. Keep the tape or wires which hold the cover in place out of your opening. Obviously the brightness of the image will be reduced, but the steadiness should be significantly improved.

3. BACKGROUND/NEARBY LIGHT

If you view in an urban area or development where nearby street lights or house lights are a bother to your eyes, here is a simple, inexpensive way to solve the problem. Buy a piece of black cloth about 3 feet square, and drape it over your head like the old-style photographers used to do. Works like a charm, and tucks away very neatly among your other gear.

4. DAYTIME TERRESTERIAL VIEWING

If using a scope which has a central obstruction for daytime terresterial viewing you'll frequently see a small spot or circle in the center of your view. This is caused by using an

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occular that produces too low a power, and the spot you are seeing is caused by your central obstruction. You have two choices. Use an occular which yields a higher power and thus makes the spot disappear, or look around the small spot.

5. SOLAR VIEWING

CAUTION, CAUTION, CAUTION. First, never view the Sun without a Solar filter. You'll do permanent eye damage in just a fraction of a second. And NEVER use a Solar filter that screws into the bottom of an eyepiece. Remember how you once started a fire with a magnifying glass? Well, a telescope works the same way and the heat will build up inside the scope to several hundred degrees in a short period of time. This will cause the Solar filter screwed into the eyepiece to crack, and the light is so powerful, your body cannot react fast enough for you to move your eye before damage is done.

Only use filters that attach to the front of your telescope, and those that will filter out 99.9 percent of the light and heat.

How critical is this CAUTION AND WARNING? You get two chances....your left eye, and your right eye!

6. LEVELING THE TRIPOD

Leveling of the tripod is not terribly critical. Reason? When you do your polar alignment, the azimuth and latitude adjustments minimizes the effect of an unlevel condition such that your polar axis is aligned on the pole, and that is the important thing you are trying to achieve. Leveling of the tripod does tend to add stability and balance to the overall system, and makes driving somewhat easier. Thus, we recommend you set up in a resonably level condition, but don't spend 15 minutes trying to get it super perfect.

NOTE: If you have an SPC-8 with German equatorial mount and the Sky Sensor computer, the more level you make the tripod, the more accurately the computer drive will work. On this system, the extra level time is worth the effort.

7. TRIPOD/TELESCOPE STABILITY

If your images shake and vibrate badly two things could be at fault. The first, and most likely, is that the tripod is too lightweight. First tighten everything on the tripod that you can tighten. If that doesn't help, fill a couple of old socks or bags with sand and suspend these from each of the legs to add weight to the tripod, or prop them against the legs to add stability. The more weight you add, the sturdier the tripod should become. If the tripod proves not to be the problem, tighten all the screws

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and set screws on the telescope mounting head. These are sometimes a lot more loose than they should be and therefore don't properly dampen the vibration. After you tighten each screw test to make sure that it isn't so tight that you'll strip something when you try to use the slow motion or fine tuning controls, or so tight you are about to burn out a motor. Normally you can figure out what each screw is controlling and can determine how tight it should be. Even if you do tighten too much, your test will quickly indicate if you've tightened something too much.

8. TELESCOPE COOL DOWN/HEAT UP

The best viewing comes after your telescope has had time to stabilize with the outside temperature. In the Dallas/Fort Worth area, this can mean cooling down during the winter, or heating up during the summer since your air conditioned house will likely have the scope 10 to 20 degrees cooler that the outside air. Thus, when you get outside, take your time setting up and polar aligning to allow the scope temperature to stabilize. This time will also help your eyes become better dark adapted and your viewing will improve.

9. USING COUNTERWEIGHTS

A scope that is significantly out of balance due to excess weight on either the front or the rear puts added stresses on both your clutches and your motor drive. You should either create your own counter weight system or acquire weights offered by the manufacturers. A scope is properly balanced when, with all clutches disengaged, the scope will stay in any position. Achieving this will make the accuracy of your drive motors more noticeable.

10. FOCUSING THE TELESCOPE

How well you can see an object is significantly impacted by how accurate you can focus your telescope. Once you get the image into resonably good focus, just think about moving the focus unit when you touch it. Many times you'll be astounded at how much clearer the view becomes. For the ultimate in focusing ability, consider buying a 'Motofocus', a battery operted focuser that eliminates wiggle when you focus, and focuses images so well that it is like adding an inch or two to an 8 inch Schmidt-Cassegrain.

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11. MAXIMUM POWER

Unless the viewing for the evening is virtually perfect and the air dead calm, the image in all telescopes will begin to deteriorate when you reach a power level that is about 50 times your aperture (2.4 inch = 120 maximum power; 8 inch = 400 maximum power). By and large, your best and clearest views will be achieved at about 20 to 30 times your aperture. With large aperture Newtonian reflectors (12" and above), you can expect the image to start deteriorating at about 30 to 40 times the aperture.

12. AVERTED VISION

The most sensitive part of your eye is not in a direct line down the center of the pupil, but is off to one side. The light receptors in this area are capable of seeing dimmer objects. Therefore when viewing with your telescope, you should use the technique called averted vision to see more detail; i.e., don't look directly at the object, but look just to the left or right and concentrate on that area. The object will seem brighter, and and your ability to see more detail will increase.

13. FIELD GLASSES/BINOCULARS

We recommend that you always take a pair of binocualrs or field glasses with you when you go out for an evening with the telescope. Many objects you'll want to see can be faintly distinguished through these. You'll find most objects are much easier to locate becuase of the wide field of view and the fact that it presents upright images as you are accustomed to seeing. Once you locate the object study the surrounding star field. These stars can then be used to help you determine which way to adjust your telescope to get the object into view. But remember your viewfinder and telescope will have the star field at least inverted, as is normal in astronomical telescopes, and possibly reversed if star diagonals are used. Thus if the object is to the right of a star in the binoculars, it will be to the left in your scope and viewfinder.

14. STAR DIAGONALS/RT ANGLE VIEWFINDERS/FINDER SCOPES

Depending on the type scope you have, and whether or not a star diagonal is used, some telescopes will display the image upside down and flopped left to right; others don't invert the image, but just flop it left and right. The same applies to viewfinders, and whether or not the viewfinder has a star diagonal. The permutations are very lenghty.

The important thing to achieve is to make sure that your view finder or finder scope IS DISPLAYING THE EXACT FIELD PRESENTATION

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THAT YOUR TELESCOPE DOES WITH YOUR OCCULAR IN PLACE.

Reason? It makes it easier for your mind to grasp which way the scope is to be moved....move it exactly the same direction that you move the view in your viewfinder or finder scope.

In most instances the most comfortable viewing through the telescope is with a right angle (star diagonal) attached. Since most of the viewing is done through the telescope and not the viewfinder, you should adjust the presentation of your viewfinder or finder scope by adding or removing its star diagonal so that the viewfinder or spotting scope has the same field display as the telescope. You'll find it makes a big difference in ease of operation.

15. EYEPIECES/OCCULARS

Eyepieces (a.k.a. occulars--you knew that since binocular means a viewing device with two occulars) are frequently the most overlooked portion of a telescope system. Remember that all the telescope does is to collect light and create an image capable of being viewed. The occular is the second piece of the viewing system. Even if your telescope creates a great image, a cheap occular can make it look awful! Therefore, buy the best quality occulars you can afford....one or two really good ones are far better than 4 or 5 low quality ones. By and large, the higher the price, the better the occular. Always go for the most expensive you can afford that has the widest apparent field of view. Actual field of view is determined by dividing the apparent field of view by the magnifying power. Thus the true field of view that results when using a 21mm occular with a 50 degree apparent field of view, is matched by a 13mm TeleVue Nagler which has an 82 degree apparent field of view. The Nagler would be producing a magnification power of 154X in an 8" Schmidt-Cass, while the 21mm would be producing a power of only 94X, and yet the true field of view would be the same. The wider field of view occulars have a larger diameter exit pupil which makes the viewing easier, and the larger true field means the image will be brighter. These wide field of view occulars cost considerably more that standard field occulars, but the views they produce are almost unbelievable and very habit forming.....it's hard to buy just one.

16. YOUR BEST SIZE EYEPIECE

The best size eyepiece for any telescope may be determined by dividing the diameter of your aperture by the diameter of the exit pupil of your eyepiece (the small opening through which you look). The quotient (answer) which falls in the range of 5 to 7 will yield the brightest, best image. The younger you are the closer the number should be to 7. As you get older that number will shrink to 5.

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17. COLLIMATING DURING DAYTIME

Check your collimation frequently, regardless of the type scope you have. You do this by de-focusing a small pinpoint light source and making sure the central circle is exactly in the center of the outer circle. If it is not, you are out of collimation and you are not getting the best from your telescope.

To collimate during the daytime try hanging a silver Christmas tree ornament a distance away that equals 500 times your aperture. Move the scope until a sunray creates a bright pinpoint light source, and use that to collimate. Start at lower powers and gradually work up until you have accurate collimation with your highest power eyepiece.
(NOTE: if your scope has an "off-axis" system you'll have to either check the owner's manual or visit the store so we can show you how much to the right or left of center the interior circle should be for perfect collimination.)

18. DEW AND WAYS TO GET RID OF IT

Unless you've got a Newtonian, you are eventually going to have a problem with dew covering the objective lens and the occulars such that viewing is impossible. There are a variety of ways to get rid of it, BUT ONE OF THEM IS NOT WIPING THE DEW OFF WITH A TISSUE OR CLOTH. Unless you're positive you've just discovered a new comet 10 times the size of Halley, or the brighest supernova ever, don't wipe the lens. Try these techniques. First, simply point the objective straight down toward the ground for 5 to 10 minutes. The dew will usually go away. If you have a can of compressed air to clean your occulars, the cold air coming from the can will usually clear the dew. Many amateurs carry a small hair dryer in their accessory bag. A short blast of this will do the trick. You can even get in your car and turn on the heater and let this air blow on the scope....but you've got to set up all over again if you do this. And by the way, don't forget to get the dew off your occulars. Sometimes dew will even form on the inside of the lens. If this doesn't go away completely by the next morning and a film remains, call us right away. That film must be removed quickly, or the chemicals will eat away your coatings.

19. INEXPENSIVE DEW SHIELDS

The dew shields offered by the manufacturers are great, but they are expensive. Here are two ways to make your own that are inexpensive. First go to an art supply store and buy sheets of solid black poster board (construction paper is not stiff enough). You'll need to make the tube of the dew shield 1 1/2 to 2 times

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the diameter of your aperture. The lineal length you'll need can be determined by calculating the circumference of your scope: Circumference = Diameter(aperture) times 3.1416, but add one inch to your diameter to take care of the outside tube casing dimension. Simply fold this around the tube and tape AND glue the tube into shape. It will slide on and off easily. The next method is to use aluminum flashing available at the hardward store and do the same thing, but you will probably have to hold it together with small screws. If you use the flashing, make sure you tape the edge that slips onto the scope or it will scratch your finish.

20. 30 MINUTES BEFORE GOING OUT

Probably the most important 30 minutes spent are the 30 before you walk out the door. Take this time to sit down and rewiew your books and charts to see what's up in the part of the sky in which you'll be looking. Almost always you'll find something nearby of interest that you had either forgotten about, or have never seen before because you didn't know it was there. Not only will you become more knowledgeable, you'll see more and have more fun.

21. CHECKING DRIVE ERRORS

Virtually all telescopes have drive error, even the large observatory scopes. There is not much you can do about it, but if you really want to determine how much you have, offset polaris by 3 to 5 degrees in your polar alignment. Now turn the scope to a bright star and take a 15 minute time exposure. Where the line is wavy indicates what part of your gear has the most error.

22. ASTROPHOTOS WITHOUT DRIVE MOTORS

Photographing the Moon without motor drives is fairly easy, since the exposure times will be 1/30th, 1/60th or 1/125th of a second. But to take photos of the sky, things start to get tougher. If your scope has a focal length of 1200mm, a one second exposure generally won't be blurred. A 600mm focal length up to 2 seconds, and a 300mm focal length up to 4 seconds. Reason? As the focal length decreases, the field of view increases, and the motion becomes less noticable.

23. ELIMINATING SHUTTER SHAKE

When you activate the shutter on your camera, the vibrations it sets off will frequently ruin a good shot since vibration can last up to 7 seconds. To eliminate this possibility, hold a black piece of cardboard in front of the lens for about 5 to 10 seconds

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after the shutter has been tripped to allow the camera and scope to stabilize and then remove the cardboard. Then, before you close the shutter, hold the cardboard in place again. No more shutter shake or mirror trip vibrations.

24. MULTIPLE IMAGES

You can get multiple images on the same slide or film fairly easily. Simply do this. Hold a black piece of cardboard in front of the lens, or drape a black, light-weight silk scarf over the objective, then turn off the drive motor for a while. Now turn on the drive and remove the scarf. Your image will now be in a new location and will expose another portion of the film. Obviously you should conduct a few visual tests on how long your drive should be turned off, and how far the image will drift, to produce the best results and not overlap images.

25. TYPE CAMERA TO USE

The new automatic cameras that have everything powered by a battery are sensational....for terresterial photograhpy. They are very definitely NOT what you want to use for astrophotography. Reason? The batteries operate the shutter, and the batteries a) don't last very long; b) are expensive; c)and, when the batteries go dead, the shutter closes....probably right in the middle of the best shot you were in the process of taking. Despair not, for the solution is simple and inexpensive. Go to the used camera section of the camera store, or to a pawn shop, and buy the least expensive used camera they have that is fully manually operated and has the mirror lock-up feature. You don't even need to buy the lens, since your telescope if going to be your lens. It doesn't matter if the camera's speeds are way off, because you're going to operate it with the shutter open for very long periods --1 to 45 minutes. Thus, so long as the shutter closes when you release the cable release, it's a great camera for astrophotographic purposes. CAUTION: a great as Hassleblads are, they can't be used for astro purposes because no one makes mounts or T-rings to adapt them to telescopes.

26. FILM DEVELOPMENT

If you don't develop your own film and send it to a commercial lab we have two recommendations. First, find a local custom processing photo lab and send it to them instead of taking it to the drug store, overnight, or 1-Hour photo service. The custom labs are usually not that much more expensive, they are accustomed to doing things overnight for professional photographers, and they do much better work and can easily bump, dodge, burn, etc. to give

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you the best out of the image you have recorded. Secondly, ALWAYS instruct the lab to process the film and leave it in strip form, regardless of whether it is slide or print film. More than one great deep sky photo has been ruined because some yoyo couldn't figure where to start the cuts and sliced a great shot right down the middle. Once you get the strip, you can look at it and mark where the cuts or prints are to be made.

27. BRACKET YOUR EXPOSURES

Because the amount of light being received on your photographic plate is so dim, rather wide time variations frequently show little or no difference. But you should always bracket, and do so in large multiples. If you have estimated or calucalted that a five minute exposure is about right, take that one and then do one at 2 1/2 minutes, and then one at 10 minutes. Film is cheap, and wishing you had not exposed for so long or exposed longer is a sad learning experience, and the solution only costs you an addition 15 minutes in the field.

28. RECORD KEEPING

A lot of amateur astronomers keep records on what they've seen, when they saw it, what techniques they used, and when doing photography, keep records of exposure times, films, etc., for future reference. If you do this, we'd suggest that instead of trying to write in the dark and hold a red flashlight at the same time, you buy one of the very inexpensive, small tape recorders and record what you wish. You can convert these to notes at a later time, and it sure beats trying to write in the dark.....but it is one extra set of batteries you must remember to have available.

29. ACCESSORY TRAYS

The "best little accessory tray in Texas" are those $1.98 folding patio trays you'll find in the discount stores. They are light weight, usually have a small lip that will keep things from rolling off, and are incredibly convenient when sitting beside the scope.

30. BEST VIEWING ACCESSORIES

These are the most useful viewing accessories we know of. In order, they are: Telrad-a bomb sight device that sits on top of the scope that makes location of objects much easier than trying to find them in the viewfinder where the image is at least left-to-right, and in some cases upside down as well. Our theory is if you can't find it, you can't see it; MotoFocus-a battery operated

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unit that enables you to very, very precisely focus what you are viewing. They not only eliminate the wobble that occurs when you focus, they really do enable you to focus much more accurately, and thus improve your view of the object. On an 8 inch Schmidt-Cass, it is like adding two inches to your aperture. Multiple Occular Holder-enables you to have four occulars on the scope. You can instantly rotate to the highest power that still gives you a good view. You only have to drop an occular once onto the wet grass to understand the value of this option. It also eliminates fumbling around in the dark to find another occular. Illuminated Reticle-device that enables you to do a much more precise polar alignment. When you center Polairs in this occular, it's centered; and, the accuracy of your drive increases significantly. Finally, a Rich Field Adaptor (if you have a Schmidt-Cass)-- while this decreases your focal length by 50 percent, it increases the brightness of the image by a factor of 4. Thus dim objects such as nebulosities and galaxies appear much brighter.

31. HAVING FUN

This is a hobby about having fun. Don't take it too seriously. Do it beacuse you want to, and when you want to. And surprisingly, it is not a hobby in which you have to be a loaner. It is a great family hobby. And a lot of your friends will frequently want to go along, but first you must ask them. And a fellow amateur will always go along. Enjoy what you see, and don't worry about what you can't see. It will be there tomorrow night, and next week, and next year when you have a larger aperture scope that can show the object.