The High Desert Observer

The Bulletin of the Astonomical Society of Las Cruces

February, 2007

President's Message

We had a good meeting in January. There were lots of interesting announcements, and a fascinating program on public education. One thing that our society is good at is working with the public. We provide telescopes and expertise at many school star parties. We run the Moonwatch at first quarter Moon in front of the International Delights Café. We also do special events like the Renaissance Faire and the X-Prize Expo.

These events allow us to bring the universe to the public. There are plenty of people who are jaded about space. Especially in this area, the birthplace of America's space program, there are those who feel space is passé. But our events reach past these people to their young ones. We

ASLC members set up for a recent star party at White Sands School, photo by Bob Long

show them the beauty and wonder of our solar system and our galaxy. We let their young minds soar among the planets and stars with our telescopes, knowledge and enthusiasm.

But it is frequently the same people who support these events. They have been doing this for a number of years, and they need your help. We have had an increasing number of schools that have asked us to support their events and it is becoming increasingly difficult to get a good turn-out of our members.

This brings me to asking for your help. These events are publicized on our Yahoo! Group ASLCNM. If you are not a member of this group, please send me an e-mail at blslcnm@comcast.net and I will send you an invitation to join the group.

When you see an event advertised on the group, please volunteer to help. Many of the events are here in town, easy for you to reach. You do not need a giant telescope, even small telescopes can show the stunning details of the Moon or a large cluster like the Pleiades or the Hyades. Nor do you need to know everything about astronomy. You can pre-pick a few objects suitable to your equipment, look up the details on the Internet and memorize them or write them down on a 3x5 card and put them in your pocket.

This is not a dull boring task, the kids that look through our telescopes are excited by what they see and their energy is contagious. You will find that you will enjoy showing them the sky and they will help you see it in a whole new way.

For the public to attend one of our events, they need to know about it. Our publicity campaigns have not always been as successful as possible, and to increase their effectiveness, we need a publicity officer. If you would like to take on this task, please let me know.

Until next month, clear skies! Bert Stevens

Next Meeting

The next meeting will be held on February 23 (fourth Friday of the month), 2007 at the usual place and time (DABCC, room 77, 7:30pm). The speaker this month will be Dr. Jon Holtzman (NMSU Astronomy Department) who will speak on "The Sloan Digital Sky Survey Supernova Search and the Accelerating Universe."

The "Astro-Tidbits" (contact: Nils Allen) pre-meeting will meet this month at 7pm. The new "Imagers Group" (Contact: Rich Richins) will meet next month. Anyone is welcome to attend these special interest groups.

Other events planed for February include:

Dark Sky Observing at the Upham dark sky site, Saturday, February 17, dusk

ASLC MoonGaze, International Delights Cafe, Saturday, February 24, dusk

Please see the ASLC website for further information (http://www.aslc-nm.org)

Keys To Successful Autoguiding

Steve Barkes

With the advent of low cost DSLR and CCD cameras, more and more people are having a go at astrophotography. Soon after trying to take decent photos, most realize that they need some type of autoguiding setup. I was in the same boat several years ago, and developed my own guiding software and made it available to others on the Internet (Guidedog). Over the last couple of years I received many requests for help in achieving good guiding, and have put together this article to address some tips, myths, and setup suggestions.

Basically autoguiding involves a separate camera from the main imager, which monitors the location of a guide star through a separate guide scope or off-axis guider. As the guide star moves around due to seeing, poor polar alignment, wind, mount errors and other factors, the guiding software issues corrections to the mount to move the star back to its original location.

The following figure shows the errors in the guide star position over an 8 minute period. The mount was roughly polar aligned using a polar scope. No guiding corrections were made to the mount, and the graph shows the errors in both RA and Dec at 1 second intervals. The graph was created in Microsoft Excel from the a log file generated by GuideDog. The blue graph shows RA errors while the Dec errors are shown in pink.

The first thing to consider in this graph is the gradual increase of errors in the Dec axis. These errors are entirely due to misalignment of the polar axis. If the mount were perfectly polar aligned, the graph of the Dec errors would be a straight line. By graphing your errors from GuideDog, or just watching the changes in magnitude of the errors on the display, it is very easy to see how well your mount is polar aligned. Of

A Great Big Wreck

Dr. Tony Phillips

People worry about asteroids. Being hit by a space rock can really ruin your day. But that's nothing. How would you like to be hit by a whole galaxy?

It could happen. Astronomers have long known that the Andromeda Galaxy is on a collision course with the Milky Way. In about 3 billion years, the two great star systems will crash together. Earth will be in the middle of the biggest wreck in our part of the Universe.

Astronomer John Hibbard isn't worried. "Galaxy collisions aren't so bad," he says. A typical spiral galaxy contains a hundred billion stars, yet when two such behemoths run into each other "very few stars collide. The stars are like pinpricks with lots of space between them. The chance of a direct hit, star vs. star, is very low."

This GALEX UV image of the colliding Antennae Galaxies shows areas of active star formation, which is not in the tidal tails as one might expect.

Hibbard knows because he studies colliding galaxies, particularly a nearby pair called the Antennae. "The two galaxies of the Antennae system are about the same size and type as Andromeda and the Milky Way." He believes that the Antennae are giving us a preview of what's going to happen to our own galaxy.

The Antennae get their name from two vast streamers of stars that resemble the feelers on top of an insect's head. These streamers, called "tidal tails," are created by gravitational forces—one galaxy pulling stars from the other. The tails appear to be scenes of incredible violence.

But looks can be deceiving: "Actually, the tails are quiet places," says Hibbard. "They're the peaceful suburbs of the Antennae." He came to this conclusion using data from GALEX, an ultraviolet space telescope launched by NASA in 2003.

The true violence of colliding galaxies is star formation. While individual stars rarely collide, vast interstellar clouds of gas *do* smash together. These clouds collapse. Gravity pulls the infalling gas into denser knots until, finally, new stars are born. Young stars are difficult to be around. They emit intensely unpleasant radiation and tend to "go supernova."

GALEX can pinpoint hot young stars by the UV radiation they emit and, in combination with other data, measure the rate of star birth. "Surprisingly," Hibbard says, "star formation rates are low in the tidal tails, several times lower than what we experience here in the Milky Way." The merging cores of the Antennae, on the other hand, are sizzling with new stars, ready to explode.

So what should you do when *your* galaxy collides? A tip from GALEX: head for the tails.

To see more GALEX images, visit www.galex.caltech.edu. Kids can read about galaxies and how a telescope can be a time machine at spaceplace.nasa.gov/en/educators/galex_puzzles.pdf.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.
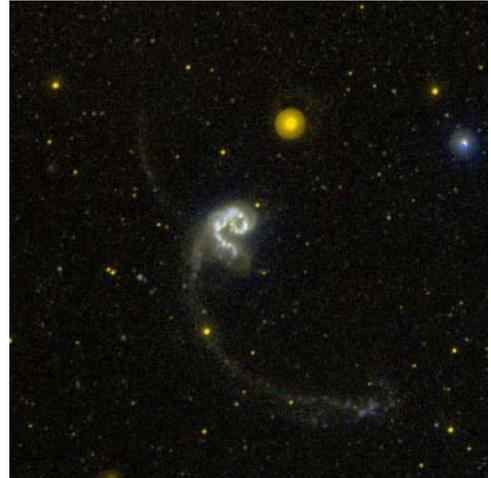
Variable Stars Part 1: Naming Variable Stars

Bill Stein

Long before Astronomy became a science, the visible stars were given names. Many of the brighter ones derive from Arabic and also have a Greek letter followed by the genitive (possessive) form of the Latin name of the constellation. For example, we know the bright red variable in Orion as Betelgeuse and as á Orionis. Johannes Bayer (1572-1625) introduced this nomenclature in his star atlas, *Uranometria*, in 1603. Bayer used lower case Greek letters, then lower case Latin letters and then extended it to upper case Latin letters. Today, most Latin letter designations are rarely used with some exceptions such as h Persei (actually an open cluster) and P Cygni (an unusual hot emission line star). Bayer's designations never went beyond the letter Q.
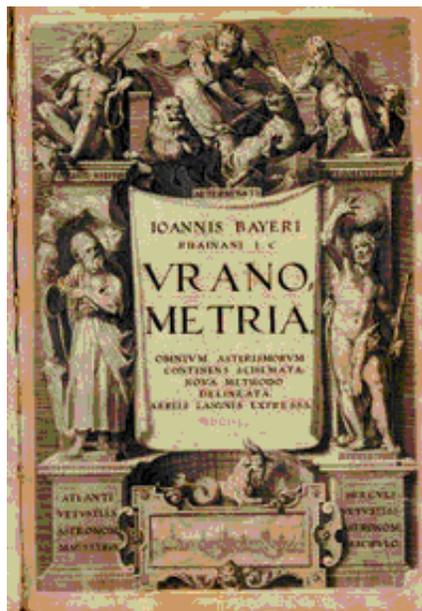
The Prussian astronomer, Friedrich Wilhelm August Argelander ((1799-1875), studied variable stars and was responsible for introducing the modern nomenclature system for identifying variable stars. Argelander is more famous or the major star catalogue of precise star positions published between 1852 and 1859. His catalogue, the *Bonner Durchmusterung* (the Bonn Survey), contains over 324,000 stars and

Uranometria

was the last major catalogue which did not use photography. Argelander initiated his system of variable star nomenclature with the upper case Latin letter R since Bayer left off at Q. Argelander anticipated that only a few variable stars would be discovered in each constellation. How wrong he was.

The International Astronomical Union (IAU) appoints a committee to determine the names given to variable stars. The IAU makes the assignments in the order in which the variable stars are discovered in a constellation. If the star already has a Greek letter designator, then the variable will be referred by the Greek letter (e.g., ä Cephei, the prototype Cepheid variable). Otherwise, the first variable in the constellation will be given the designator R, the next one S, and so on to the letter Z. Thus the first such variable in Aquila is R Aquilae. After we use R through Z, the next star will be named RR, then RS, and so on to RZ; SS to SZ and eventually ZZ. Then the naming starts over at the beginning of the alphabet with double letters: AA, AB … AZ, BB, BC …BZ, CC … and so on continuing to QQ … QZ with J left out to avoid confusion with I. After 334 letter combinations, the IAU gives up and just uses V followed by a number. Thus, V335 Sagittarii follows QZ Sagittarii. Since 1925, novae also have been given variable star designators, e.g., DQ Herculis.

As if this weren't confusing enough, there are a host of other prefixes and numbers assigned to variable stars. The American Association of Variable Star Observers (AAVSO) uses a second system of names – numerical designators. The designation, called the *Harvard Designation*, is a group of six numbers and a sign that gives the variable's approximate coordinates for the year 1900. The first four numbers give the hour and minutes of right ascension while the last two (with a plus or minus sign) give the degrees of declination. For example, R Leonis would be 0942+11. Finally, we use NSV xxxxx as variable star designators in the Catalog of New and Suspected Variable Stars, produced as a companion to the Moscow General Catalog of Variable Stars (GCVS). See: http://www.sai.msu.su/groups/cluster/gcvs/gcvs/

In Variable Stars Part 2, I will discuss the classes of variable stars giving some examples and prototypes using the IAU designation.

Autoguiding, continued from page 2
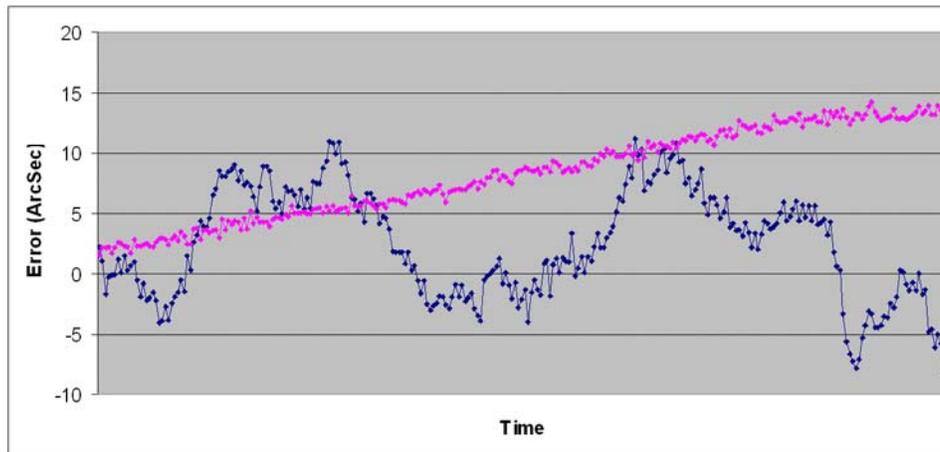
course perfect polar alignment is not really possible, especially for a portable mount. Your goal should be to reduce the error as much as possible through a careful drift alignment.

This leads to one of the biggest myths associated with autoguiding:

Since I'm autoguiding, I don't have to worry about getting a good polar alignment.

Autoguiding is not a substitute for careful polar alignment. If you were to guide perfectly on a star on a poorly polar aligned mount, your images would still suffer from field rotation. However the rotation will be centered on the location of the guide star instead of the center of the polar axis. The longer the focal length of the imaging scope, the more important the polar alignment becomes. With widefield imaging and a camera lens of less than 135mm, guiding is probably not necessary at all. But with any focal length greater than 135mm, guiding is a necessity.

Next we want to look at the errors in RA on the previous figure. Notice the variation from second to second of the position. Most of this error is due to local seeing. Seeing can introduce errors ranging from a fraction of an arc second to well over 6 arc seconds on a poor night. If you look at the long-term error over 8 minutes, you'll notice the trend of the graph show various peaks and valleys. These are associated with periodic error within the mount. All mounts have periodic error which is caused by imperfections in the gears, and how they mesh together. While a more expensive mount will generally have less periodic error, there is no perfect mount. And many amateurs are using cheap Chinese mounts which can have huge amounts of errors. These errors manifest themselves as elongation of the stars in your image, and are exactly the kind of errors that guiding will help reduce.

Before I cover tuning your guiding parameters, I want to address a couple other myths associated with running GuideDog.

I need to increase the gain and exposure to ensure my guides star is big and bright.

The centroiding algorithm used for guiding works by identifying an area of the picture that may be a star image. Once a group of pixels is identified which have a brightness value above a certain threshold over the sky background, the values of those pixels is interpolated in both the horizontal and vertical direction. Using this technique, the software is able to identify the middle of a star image to a fraction of a pixel. If the gain and exposure are increased to make the star image more visible on the screen, more of the stars pixels

can saturate to a maximum pixel value. Once this happens, the centroiding algorithm can no longer accurately determine the true center of the image, and the guiding will be adversely affected.

I need a Barlow on my guide scope to ensure my guiding focal length is the same or greater than my imaging focal length.

This is a direct throwback to the visual guiding days of film photography. Because of human reaction time, large magnification was needed on the guide scope to detect and react to errors that need to be corrected. With computer guiding and processing, the software can easily guide to sub-pixel accuracy. The ability to detect changes of guide star position to 1/10 of a pixel is easily accomplished. So I recommend a guiding focal length of 25-50% of the imaging focal length. This is just a rule of thumb, and you can go less or more.

Before discussing how to tune your guiding setup, it is necessary to understand some of the various settings in GuideDog. With this understanding, you'll be able to better make adjustments to get great results. There are five settings in the options tab which you will want to adjust for tuning your guiding.

Guide Rate: This is the rate at which the mount moves when a correction is made, and is specified in arc seconds per second. When the mount is tracking the stars, the mount is moving at a rate of 15 arc seconds per second which will offset the rotation of the earth relative to the stars. When guiding corrections are made, the mount will speed up or slow down relative to this tracking rate. In the past, most mounts would stop the motor when guiding to the East. The effect of this is that the star would continue to move in the FOV at a rate of 15 arc seconds per second. When a correction was made to the West, the motor would run at twice its normal tracking rate, which resulted in a movement of 15 arc seconds per second in the FOV. Because the mount was running at twice its rate, this guide rate was commonly referred as 2x sidereal. Actually this rate is 1x sidereal, as the movement of the star is 15 arc seconds per second in the FOV, which is the sidereal rate. This has led to a lot of confusion by anyone trying to specify their guide rate in GuideDog.

In addition many mounts will allow a guiding rate of less than 15 arc seconds/second. Commonly available are 0.3X, 0.5X, and 0.7X. These values are fractional percentages of the sidereal rate. So 0.5X would be 7.5 arc seconds/second. And some mounts allow the guide rate to be set as a percentage of sidereal. In this case 50% would be 7.5, 100% would be 15, and 150% would be 22.5 arc seconds per second.

The guide rate entered into GuideDog is used along with the focal length of the guide scope and the pixel size of the camera to determine the image scale on the camera. Once the image scale is known, the length of time needed to make a correction can be calculated.

Minimum Error: The minimum error is specified in arc seconds and determines how much error must be present before a correction is sent to the mount. For example, if the minimum error is set to 2.5, then no corrections will be made until the calculated error is 2.5 or greater.

Maximum Error: The maximum error is specified in arc seconds and determines the greatest correction that will be sent to the mount. If the calculated error exceeds the maximum error, then a correction will be made equal to the maximum, otherwise the correction will equal the calculated error, so long as it is greater than the minimum error. So if the maximum error is set to 7.5, and the calculated error is 8.2, the correction made to the mount will be 7.5. Likewise if the maximum is set to 7.5 and the calculated error is 7.4, the correction to the mount will be 7.4.

Aggressiveness: The aggressiveness setting ranges in value from 50 to 150 with the normal value being 100. This setting adjusts the corrections made to the mount as a percentage of the calculated error. If the

Minutes, January 2007 Meeting

Bert Stevens, ASLC President, called the meeting to order at 7:35 pm. He gave a brief address welcoming the membership to the first meeting of the new year. He stated that the first meeting of the 2007 ASLC Board of Directors would be announced via the aslc-bod yahoo.group.

The minutes of the last meeting were unanimously accepted by those present as published.

There was neither a secretary's nor a treasurer's report.

There was no old business.

The new business was-

1) The Contact, Officers, Club Bylaws page has been revised and is posted on the aslc-nm.org web page.

2) Bill Stein reported that Bernie McNamara (NMSU Astronomy Department) has a Meade 16" telescope that was obtained with research grant money and is no longer being used. If the club has an interest in using it for amateur research, public education and outreach and the like, it may be available for use. Vince Dovydaitis suggested acquiring this telescope and using the dome the club has in storage to establish an ASLC Observatory that could be open to the public. He presented a motion to establish an Observatory Committee to establish the requirements for such an observatory. Discussion followed focusing on possible sites for the observatory, security requirements (guard/watchman), ancillary costs, possible robotic observing, fees, accessibility, etc. The motion was seconded and approved by voice vote. Vince will act as chair of the new committee.

The following announcements were made:

1) Vince Dovydaitis announced that he had received the latest AAVSO newsletter publishing the number of observations recorded by that association's members in 2006. He noted that of the approximately 264,000 observations in the US, New Mexico had the most (56,000) recorded of any state with only seven (7) observers. Of those, one NM observer, ASLC's own Bob James, recorded the most (46,000), more than some other states' totals.

2) Plans for the Summer Solstice Star Party at the Gila Cliff Dwellings are progressing. The event will take place over the weekend of 22-23 June. More details will be announced in the High Desert Observer. An urgent request for an experienced pig roaster was issued.

A motion to adjourn the business portion of the meeting was entertained and passed by voice vote. The business meeting was adjourned at 7:50 pm.

calculated error is 4 arc seconds, and the aggressiveness is set to 100, 100% of the error will be corrected and a movement command of 4 arc seconds will be sent. If the value of the aggressiveness is set to 75, then 75% of the 4 arc second error will be corrected. Likewise, if the value is set to 125, 125% of the error will be corrected.

Backlash: All mount suffer from backlash. Backlash is slack in the gear train that causes a delay in movement when the motors change direction. Backlash is necessary to prevent the gears from binding, but causes problems with guiding because the mount does not immediately respond to a correction. Most mounts have a built-in backlash correction setting. When the motor is reversed, it is normally run at a higher speed for a short amount of time to take up the slack in the gears. The backlash setting in GuideDog only increases the time of the correction to allow for the backlash to be taken up. You should always set your backlash correction in the mount as it's is much quicker than the GuideDog implementation. The only reason to set a value for this setting is if your mount does not include a backlash adjustment. Also note that backlash is normally only an issue in RA. There is generally no reason for a change of direction in Dec as all of the errors introduced by misalignment should be in one direction. Another way to deal with RA backlash is to always use a guiding rate of less than 1x sidereal. If the guiding rate is less than 1x, the motors will slow down or speed up, but will never change direction. This ensures that the gears stay meshed and there is no backlash introduced by changing direction.

As a start I would recommend the following settings in GuideDog:

Minimum Error: 2.5   Maximum Error: 5.0

Aggressiveness: 100   Backlash: 0 (set in the mount)
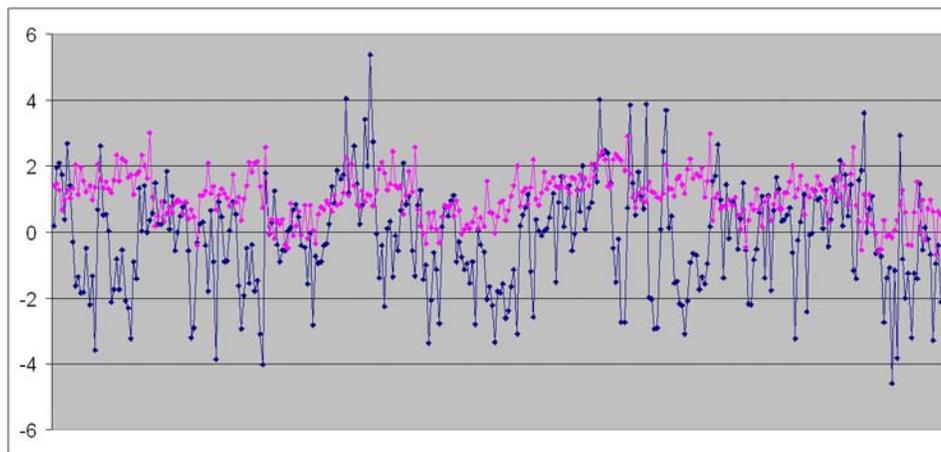
This figure shows another 8 minute period using these default settings in GuideDog. These data were gathered immediately after the previous figure, but with guiding enabled.

This graph shows a good improvement over the unguided one, and is typical of the results you might expect to see. For each of the parameters I'll discuss reasons you would want to make changes and how to make them.

Minimum Error: The biggest reason to make changes to this value is local seeing. On an average night here in NM, the default value of 2.5 works well. If the seeing is excellent, and the stars through an eyepiece

or camera are really steady, you can reduce the value to make more frequent and smaller corrections. You can try setting this value to 2. The seeing is almost never going support setting this value to less than 2. If it is set too low, the guiding software will try and chase the seeing and more than likely overcorrect causing more problems. More likely is the case where the seeing is not very good. On those nights you need to adjust this parameter up to perhaps 3-3.5 to avoid chasing the seeing. Looking at a graph, or the real time error display, frequent fluctuations from positive to negative and back indicate that you are chasing the seeing and need to make an adjustment.

Maximum Error: Like Minimum Error, the Maximum error should be adjusted dependent on local seeing. Another reason to adjust this parameter is wind. Basically you don't want to make a full correction for a fleeting change in seeing or a wind gust. On a night of extremely poor seeing, or gusty winds, you can increase this value to 7.5-10 to try and help with these random fluctuations.

Aggressiveness: This is the most common adjustment, and quite possibly the only adjustment that you'll need to make. The length of any one guiding correction is determined by a calculation involving the guide scope focal length, camera pixel size and mount guide rate. For many reasons this calculation may not be accurate. If you're using a focal reducer on the guide scope, the spacing of the reducer can change the effective focal length of the scope. So the value entered may not be correct. Also the location of the target in declination will affect the guiding rate. While these numbers can be calculated to many decimal digits, they are not necessarily accurate. By examining the graph, or real time error display, you can see if an adjustment in aggressiveness is necessary. Note that in figure two, any error less than 2.5 will not be corrected due to the minimum error setting. Look at the graph and find values larger than 2.5 (either negative or positive), then look at the next data point. If all were perfect the next error should be zero. But it rarely is. Part of this is due to seeing, and part is due to miscalculation of the correction. What you want to do is look at the graph over a long period of time, and see if you consistently over or under correct for the error. If you under correct, then increase the aggressiveness by 10-15%, if you over correct then decrease it by 10-15%. After making a change, monitor the display/graph for several more corrections and repeat the adjustments as necessary.

Finally you need to set your expectations based on the quality of your mount and the local conditions. Don't expect to get great results in March when the wind is blowing at 35 mph. Don't expect to be able to guide at +/-2 arc seconds if the star image is bouncing in the eyepiece like a ping pong ball. And finally, even though $750 is a lot of money for someone to spend on a mount, it isn't a lot of money on a grand scale. Really good mounts will easily run $7,000-$13,000 and they still will suffer from some periodic error. For your average mount if you can get your errors to less than +/- 5 arc seconds you are doing well. On a good night, with a great polar alignment and excellent seeing you might expect +/- 2.5 arc seconds, but remember that this will be the exception rather than the rule.

Clear Skies and Smooth Guiding!

Telescope Making Workshop is coming!

Nils Allen

I head up the Telescope Making Workshop for the Society. It's been my dream to get good, inexpensive telescopes into people's hands and have fun doing it! The Spring 2007 Telescope-Making Workshop is fast approaching: we start with a short. but important, overview briefing a few days before we actually start

Telescope Building, continued from page 9

making the scopes...it takes about an hour. Then the actual building sessions will be held on the following three Saturdays: March 17, 24, and 31. Each session starts about 10am and lasts 4-5 hours. The cost is $95, which provides a complete kit, instructions, most tools, a place to work, and instructor assistance. Each builder provides the paint/stain/decorations of their choice. Remember, this is a great partner project - so we encourage builders to bring a child (over 9), grandchild, spouse, or whoever — this can be a real fun experience! Please let me know if you think you desire to participate (via email, nils_a@comcast.net preferably or by phone, 522-1456). I never know how many will choose to participate, so there's a chance that some may have to wait till another workshop to take part.work space is limited. Please consider the following facts when deciding: 1) While no previous experience is required, some ability with basic tools and woodworking will really help; 2) everyone needs to fully participate in all 3 of the lengthy work sessions. I might hold a one-day compressed workshop in April for folks short on time.

January Meeting Minutes, continued from page 7

General discussion followed.

The following announcements were made:

1)   Janet Stevens announced that she still has one copy of the RASC 2007 Observer's Handbook that can be purchased and additional copies of the Reflector for any members that would like another copy or had not received theirs by mail. She also has the newsletter from the National Radio Observers Association announcing its upcoming 16th Anniversary Meeting in Green Bank, WV. Additional High Point Scientific catalogs with an available ASLC discount are also available.

2)   New member, Frank Cooper, was present and introduced himself to the membership.

3)   A new Imagers Group has been established within ASLC and held its first meeting prior to the general business meeting. It plans to meet before every other monthly meeting, alternating with the Astro Tid-Bits (formerly the Beginner's Corner) gathering. Members of the Imagers Group will provide two meeting programs in the coming year.

4)   Nils Allen announced two school star parties scheduled so far in February. The White Sands Schools Star Party is scheduled for 06 February and he is counting on the same group of member volunteers from January to support it. See him for details. The Sunrise Elementary School Star Party is scheduled for 08 February. Laura Humphreys, 4th grade teacher and ASLC member, was present and presented a list of needs and desires for the evening. She would also welcome in-class volunteers and indoor presentations to lay the groundwork for the evening's viewing. Nils also announced a star party at the White Sands National Monument on 15 February that is in the planning stages. Nils is looking for a volunteer to conduct next month's Astro Tid-Bits session; please contact him.

5)   Steve Barkes announced that he has binoculars and a table top mount available for examination and purchase after the meeting.

6)   George Hatfield announced that he always is looking for articles for the High Desert Observer. He suggested that an article of historical interest, i.e., the numerous telescopes that Clyde Tombaugh built while he lived in Las Cruces... the design, use and where they are now, would be welcome.

Nils Allen presented the program for the evening: "Educational Opportunities through ASLC - The fine art of Shaping a Successful Stargazer or How to Help Wanna-be Astronomers Achieve their Goals." Nils focused on the "lessons learned" from the New Telescope Owner's Clinics and the Beginner StarGazer class offered

Minutes, continued from page 10

through the DACC regarding the expectations of newcomers to astronomy. He highlighted how these expectations and the temperament of each individual can either help or hinder the budding amateur astronomer. He also gave an overview of a presentation on light and telescopes used in the Beginners class. This and other meeting presentations can be seen on the web at http://www.aics-research.com/lectures/aslcnm/.

Mosaic of M35, NGC2158 and IC443
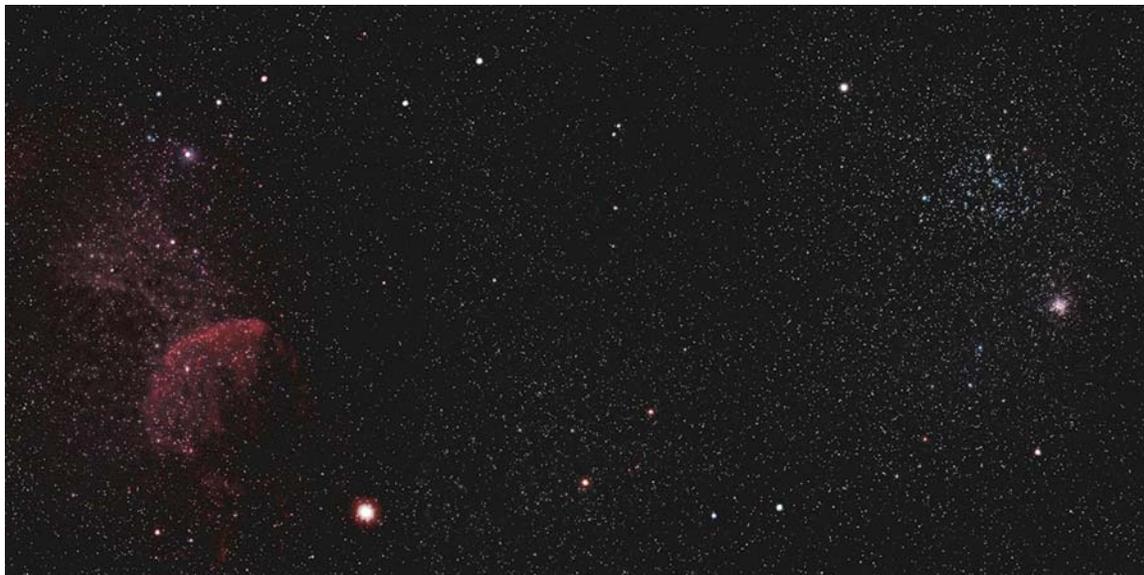
This image was taken by Rich Richins through his ED80 equipped with a Canon 300D. The images were taken from his backyard.

ASTRONOMICAL SOCIETY of Las Cruces
PO Box 921
Las Cruces, NM 88004

ASLC - Sharing the Universe
With Our Community
for Over 50 Years