Saguaro Astronomy Club

SACnews

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SAC Officers

President: Rick Tejera
623-572-0713
president@saguaroastro.org
Vice President: Paul Lind
602-863-3077
pulind@qwest.net
Treasurer: Paul Dickson
602-841-7044
treasurer@saguaroastro.org
Secretary: Jennifer Polakis
480-967-1658
Secretary@saguaroastro.org
Properties: Tom Polakis
tpolakis@cox.net
480-967-1658
Public Events:
Jack Jones
623-322-1559
publicevents@saguaroastro.org
Astro-Imaging Sub Group: Al Stiewing
623-875-3969
amst@cox.net
SACNEWS Editor:
Rick Tejera, 623-572-0713
saguaroastro@cox.net

Inside This Issue

Real Science with a Meade DSI Pro CCD Camera

By Jeff Hopkins

Introduction

Astronomy is fun! Learning the sky, finding a dark sky location and then locating deep sky objects can be a joy. This can keep many astronomers happy for years. Even modest equipment, such as a pair of binoculars can go along way to help explore the night sky. By adding a modest telescope the fun is increased considerably. The next step is usually astrophotography. Gone are the days of frustration with wasted film, hypersensitive procedures and cold boxes. With the new CCD cameras available to amateur astronomers for very reasonable prices, a whole new world of astronomy opens up.

The CCD camera allows the astronomer to image real time. Not only that, the CCD is more sensitive than the old film method. With the greater sensitivity come some delightful surprises. While dark sky observing is ideal, it is not necessary for imaging most deep sky objects with a CCD camera. Phoenix, Arizona has some very clear skies, but due to the population growth the night skies are very bright. On a good night one is pressed to see 3rd magnitude stars with the naked eye from within Phoenix. Other cities are even worse. The great whirlpool galaxy M51 is not visible even through my 12" LX200GPS yet with just a one second exposure with the CCD camera connected to the 12" scope it pops into view. A 60 second exposure produces great detail.

Figure 1-M51 60 second DSI Pro single exposure, no processing.

CCD Cameras

There are many cameras to choose from. At the low end of the options are the old Cookbook CCD and web cameras. The web cameras have proved to be excellent for solar system objects and with some modifications they are suitable for deep sky objects. In the mid-range are the Meade cameras such as the Pictor line ($400 to $2,000), DSI Color ($299), DSI Pro Monochrome ($399), DSI II Color ($599), DSI Pro II ($599). Others include the Orion StarShoot (no longer available), and Atik-161C ($645) Monochrome or Color cameras. From there on to the high end you will be paying a thousand to many thousands of dollars for a CCD camera. It can be hard to justify the more expensive cameras when the less expensive ones, e.g., the DSI series, work so well. The advantage of the color cameras is that they can produce color images with one exposure. The advantage of the monochrome cameras is that they are considerably more sensitive and with the addition of color RGB filters can also produce color images, but require 3 or 4 exposures. For Real Science, the monochrome cameras are preferred due to its better sensitivity and the ability to choose what filters to use.

Note: the DSLR (digital single lens reflex) cameras can also be used for astro-imaging, but tend to be expensive and are not monochrome.

(Continued on page 3)

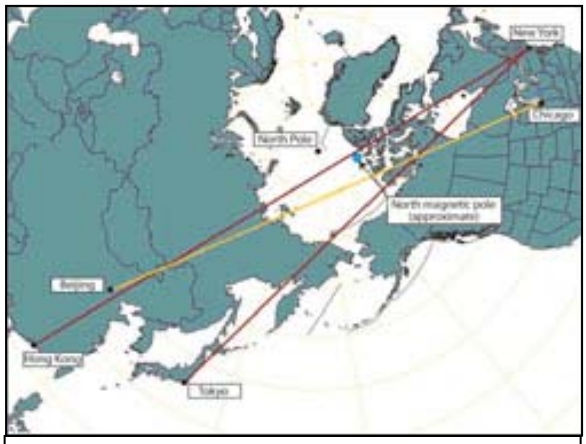
NASA Space Place

Space Weather for Air Travelers

By Dr. Tony Phillips

At a time when much of the airline industry is struggling, one type of air travel is doing remarkably well: polar flights. In 1999, United Airlines made just twelve trips over the Arctic. By 2005, the number of flights had grown to 1,402. Other airlines report similar growth.

The reason for the increase is commerce. Business is booming along Asia's Pacific Rim, and business travel is booming with it. On our spherical Earth, the shortest distance from Chicago to Beijing or New York to Tokyo is over the North Pole. Suddenly, business travelers are spending a lot of time in the Arctic.



The shortest airline routes from the Eastern U.S. to popular destinations in Asia go very near the magnetic North Pole, where space weather is of greatest concern.

With these new routes, however, comes a new concern: space weather.

"Solar storms have a big effect on polar regions of our planet," explains Steve Hill of NOAA's Space Weather Prediction Center in Boulder, Colorado. Everyone knows about the Northern Lights, but there's more to it than that: "When airplanes fly over the poles during solar storms, they can experience radio blackouts, navigation errors and computer reboots—all caused by space radiation."

In 2005, United Airlines reported dozens of flights diverted from polar routes by nasty space weather. Delays ranged from 8 minutes to nearly 4 hours, and each unplanned detour burned expensive fuel. Money isn't the only concern: Pilots and flight attendants who fly too often over the poles could absorb more radiation than is healthy. "This is an area of active research—figuring out how much exposure is safe for flight crews," says Hill. "Clearly, less is better."

To help airlines avoid bad space weather, NOAA has begun equipping its GOES weather satellites with improved instruments to monitor the Sun. Recent additions to the fleet, GOES 12 and 13, carry X-ray telescopes that take spectacular pictures of sunspots, solar flares, and coronal holes spewing streams of solar wind in our direction. Other GOES sensors detect solar protons swarming around our planet, raising alarms when radiation levels become dangerous.

"Our next-generation satellite will be even better," says Hill. Slated for launch in 2014, GOES-R will be able to photograph the Sun through several different X-ray and ultra-violet filters. Each filter reveals a somewhat different layer of the Sun's explosive atmosphere—a boon to forecasters. Also, advanced sensors will alert ground controllers to a variety of dangerous particles near Earth, including solar protons, heavy ions and galactic cosmic rays.

"GOES-R should substantially improve our space weather forecasts," says Hill. That means friendlier skies on your future trips to Tokyo.

For the latest space weather report, visit the website of the Space Weather Prediction Center at http://www.sec.noaa.gov/ . For more about the GOES-R series spacecraft, see http://goespoes.gsfc.nasa.gov/goes/spacecraft/r_spacecraft.html . For help in explaining geostationary orbits to kids—or anyone else—visit The Space Place at http://spaceplace.nasa.gov/en/kids/goes/goes_poes_orbits.shtml .

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(Continued from page 1)

Real Science

All right, you have your telescope and CCD camera. How can you do real science with this equipment. There are several areas where you can contribute.

- Super Nova Searches
- Astteroid Searches
- Comet Searches
- Occultations
- Photometry

The searches may sound attractive and are basically easy. The problem is that they take great dedication and time. Professional astronomers have multiple intensive programs with much bigger telescopes and more expensive equipment to do these full time. While it is certainly possible you could contribute, the probability is quite low.

Occultations can be fun. Because there are certain paths the occultation shadow follows, it is best to use a portable system so you can move to the path. Video cameras are more applicable to occultation work than regular CCD cameras.

Stellar photometry, measuring the changing brightness of stars, with a CCD camera can be very interesting and your results can make significant contributions to astronomy. There are several reasons photometry is well suited for a suburban backyard astronomer in a light polluted area. While many seemed bent on seeing how faint they can image, for most of us the other direction is better. It is best to leave the faint objects to the professionals as that is why they have the bigger telescopes and space-based telescopes. What has happened is thousands of interesting brighter stars (brighter than 12th magnitude, many even brighter than 5th magnitude) are no longer observed by professionals. The main reason is they cannot get telescope time for them and in most cases the stars are too bright for them to observe with the larger telescopes. This doesn't mean these star systems are no longer of interest or no longer have things to be learned. The beauty of this is that here is a perfect place where the amateur can jump in and fill a need.

Normally doing photometry requires seeing the stars visually so you can center them in a diaphragm for measurement. Stars fainter than 9th magnitude just are not visible in the bright night sky, even through the telescope's main optics. However, with a properly aligned telescope and use of a focal reducer you can get very close to the position of the star. A CCD image can easily show 13th magnitude stars with a one second exposure so it becomes fairly easy to find the star using the CCD camera.

Meade DSI Pro Monochrome CCD Camera

I have tried several different CCD cameras and am impressed with the Meade DSI Pro camera. While $399 is far from cheap it is a long way from the high end camera prices. In addition the DSI Pro can even be purchased for only $129 when purchased with a new Meade telescope.

While the DSI Pro can be used as is right out of the box, to be used for photometry some things must be changed and added. First, the filter slide arrangement for the camera is not good. The slide exposes the expensive photometric filters to dust and damage. See Figure 2.

Get rid of the filter slide and replace the slide adapter plate with the low profile adapter plate from ScopeStuff ($37.00)

Figure 2-DSI Pro with Filter Slide

http://www.scopestuff.com/ss_dsif.htm

Figure 3-Low Profile Adapter (left) and Original

Next add a thermoelectric cooler (TEC) to the back of the

(Continued on page 11)

Call For Observations–Aquarius

By A.J. Crayon

This month's constellation had two interesting features. First is a report on visibility of Cederblad 193 and the colors of 107 Aquarii. Both produced interesting results. For those that looked for Cederblad 193, both indicated it was seen. See reports from Charlie Whiting and Dan Gruber. Here is the story. It is also listed as NGC7088 and has the moniker *Baxendell's (Un-photographable) Nebula*. The un-photographable should give you a hint. The NGC/IC Project lists it as none existent with the support of POSS1 prints and Siding Spring films. However, there are some wished observations that, from time to time, appear. So the real story is ... this object doesn't exist and our observers reporting its non-existence gave the correct answer! Congratulations to both observers!

For 107 Aquarii there seems to be a consensus amongst the observations, if we ignore telescope apertures. The primary is seen as white and the secondary blue. These reports are more consistent than I expected, but that is part of the fun!

Now let's get on to the observations.

NGC7293, the Helix

8" f6, Newtonian, 60X; Charlie Whiting: this PN was big and round as seen through narrowband and OIII filters. It was visible without filters but the view was much more stunning with a filter. The nebulosity was pretty evenly diffuse. I did not see any color. I saw several stars shinning right through the nebula. I kept looking for a hole in the middle but did not see it.

8" f6, Newtonian, 71X: Rick Tejera: Very Large & Bright. Averted vision does not bring out any detail. Both lobes noted and the very much darker in the middle. With out filter much less clear but dark center still dicernable.

10" f4.5, Dobsonian, 70 Ken Reeves: Brighter on the outside and fainter in the middle. NE and SW sides are definitely brighter. About 8 stars in the nebula, star on E, on the NE is a star right on edge of nebula. It is very large, pretty bright, round and annular. One of the best objects in the sky!

16" f4.4, Newtonian, 90X; Rick Rotramel: PN - vL, fB, open oval, with filaments like cotton. A chain of stars I call "the necklace" overlaps the nebula as if holding the Helix on its chain.

18" f4.5, Dobsonian, 135X; Dan Gruber: This nebula has very low surface brightness. A UHC filter brought out the most detail, an OIII filter somewhat less. The nebula resembles a "doughnut" about 15' in diameter, with a much lighter center (the "hole") 7' – 8' across. The central star (mag ~12) was visible along with at least 6 more mag 11 – 14 stars within the disk of the nebula. The northern and southern portions of the nebular ring were noticeably brighter than the rest. In fact, the northwestern arc of the ring was almost completely absent. There appears to be a fairly close mag 10 – 11 double just south of the nebula.

20" f5, Dobsonian, 115X; Ken Reeves: With no filter, very large, somewhat faint, elongated 1.25:1 WNW/ESE, definitely darker in the middle, but not as dark as outside. The NNE and SSW sides are brighter, 10 stars included, 2 on the inside. The object responds very well to the O-III filter. With the filter, only 3 of the involved stars are visible. The center is much brighter, almost as much as the edges. The NNE side is the brightest. Averted vision may show some texture, but unsure.

M2

8" f6, Newtonian, 49X: Rick Tejera: Very bright cluster w/ dense central core. Elongated slightly E-W. Very gradual fading into halo from core.

8" f6, Newtonian, 122x: Rick Tejera: Under higher power the central core shows the slight E-W elongation noted under low power. Halo appears to have graininess at higher power not observed at low power.

8" f6, Newtonian, 180X; Charlie Whiting: This marvelous GC is just visible in my **9x50** finder scope observing from Glendale. In the main telescope M 2 is large, mostly round and has 3 levels of brightness. The 1st level, the core, is very bright for a deep sky object. It extends for about 3' in diameter. The 2nd level is the faint halo that is clearly visible with direct vision. Its extent is about 5' or 6' in diameter. For the 3rd level I used averted vision and traced a circle around and around M 2. Very faint patches of nebulosity appeared. Estimated diameter is 8'. No stars were resolved, but I felt the anticipation of being just barely unable to resolve some. There's a 10.3 mag star to the NE and two 11.5 mag stars to the SE. Three weeks later I re-observed from Sentinel. It was stunning! AJ asked me if my GoTo scope placed M 2 in the FOV. I said, "No,

(Continued on page 5)

(Continued from page 4)

and it was the only object that it did not." Must be a difference in the coordinates. I searched for **Cederblad 193** but did not see it.

10" f4.5, Dobsonian, 140X; Ken Reeves: Very bright, fairly large, round, about 50 stars over very bright haze, center is much brighter, halo is pretty significant, slight elongation N/S, 1 bright star out of halo on E. E side is cut off. Haze is very granular. Did not look for CED 193.

12.5" f4.6, Newtonian, 100X; Rick Rotramel: GC - pL, pB, vRich, a little oval, resolved, Very Nice!

18" f4.5, Dobsonian, 135X; Dan Gruber: At low power, there appears to be a solitary mag ~9 star on the NE side of the cluster, about 4' from the cluster center. Its isolated appearance may indicate the presence of a dust lane obscuring background stars in that area. At **460X** there is a partially resolved symmetrical core about 2' in diameter. A dense disk of stars extends beyond the core with a diameter of about 4', slightly elongated NW – SE. Chains of stars extend radically or pinwheel out from the central disk for a total diameter of 10' or slightly more. There is some scalloping along the NE edge of the core, perhaps by a dust lane. At **74X**, there was no evidence of any nebulosity at all in the vicinity, with or without UHC or OIII filter. So I did not see **Cederblad 193**.

20" f5, Dobsonian, 180X; Ken Reeves: Pretty large, very bright, round, very loose on the edge with the star density increasing evenly to a bright center which contains a very nice granular haze. There is a bright star to the E of center, then a void beyond that. Estimated 150-200 stars resolved, probably more if wind wasn't jiggling the scope. Did not look for CED 193.

NGC7606

8" f6, Newtonian, 38X; Charlie Whiting: This galaxy was visible at **38X**. At **160X** 7606 is in a field with only dim stars. There is a 12.5 mag star due south and a 13.3 mag star to the north. It is elongated ~4' x 1'. Aligned about 30° west of north.

8" f6, Newtonian, 60X: Rick Tejera: Seen Elongated about 3-1 ENE-WSW. Dark lane through major axis. A bit brighter to the east, gradually fading to the edges

10" f4.5, Dobsonian, 70X; Ken Reeves: A nice elongated galaxy, somewhat brighter middle. Stars bracket this galaxy in a diagonal. Middle bulges. At **100X** occasional non-stellar nucleus seen. Elongation is NW/SE. Two stars form a line NNW/SSE. I really like the stars framing the galaxy.

16" f4.4, Newtonian; Rick Rotramel: G - pL, pF, edge-on with a much brighter nucleus.

18" f4.5, Dobsonian, 209X; Dan Gruber: This galaxy has a 5' X 2' halo elongated NW – SE surrounding a fairly bright core about 1' in diameter.

20" f5, Dobsonian, 180X; Ken Reeves: Somewhat small, pretty bright, elongated 3:1 NW/SE. Lenticular shape brightens up toward the middle and a bright non-stellar nucleus. Nice star field, very nice object.

NGC7184

8" f6, Newtonian, 38X; Charlie Whiting: At **38X** I see a group of mostly 10th mag stars outlined like an arrow point, due west of 7184, pointing directly at the galaxy. At **160X** this galaxy is very elongated, ~6' x 1'. Aligned roughly E-W. There's a 12th mag star just off of the west edge of the galaxy. The middle is gradually brighter than the halo, which seems to be uniformly diffused.

8" f6, Newtonian, 80X: Rick Tejera: Seen as elongated E-W about 3-1. Fairly broad in the center and pretty uniform in brightness throughout.

12.5" f4.9, Newtonian, X; Rick Rotramel: G - pL, pF, edge-on with a much brighter nucleus.

18" f4.5, Dobsonian, 135X; Dan Gruber: This galaxy has a small, moderately bright core surrounded by a highly elongated halo extending about 6' X 1' NE – SW. There is a mag 12 star at the NE tip of the halo and another mag 12 star about 2' SW of the SW tip of the halo.

20" f5, Dobsonian, 180X; Ken Reeves: Pretty bright, slightly large, elongated 4:1 ENE/WSW. It has a much brighter middle with a sub-stellar nucleus. Star on ENE end, 2 stars on the WSW end. Appears cut off on the S side. Averted vision shows this quite well. Faint star involved on the E side, held about 20% of the time.

NGC7492

This globular cluster did not appear to be as difficult as expected. Perhaps better observers, better observing aids or some other intangible.

8" f6, Newtonian, 60X: Rick Tejera: Seen as very faint and round, about 5' in diameter. Framed between two stars to the E & W respectivly. Uniform brightness throughout.

8" f6, Newtonian, 240X; Charlie Whiting: At **240X** this GC is very small and very dim. It was very difficult to

(Continued on page 6)

(Continued from page 5)
make it out. It is situated between two 13th mag stars to its east and northeast. SAC data says it is 4.3' diameter, but I saw only 1' - 2'.

10" f4.5, Dobsonian, 70X; Ken Reeves: Very faint, pretty big, need averted vision to see it, moving the scope helps, suspect granularity, suspect a little brightening toward middle, round. There are stars to E, WNW and WSW. Nice triangle on the WNW.

18" f4.5, Dobsonian, 209X; Dan Gruber: This cluster has very low surface brightness, to the point where it looks practically nebular. It was an unresolved, diffuse, irregular light patch about 5' across. There was a semi-circle of about 6 mag 12 – 13 stars around the southern half of the patch's circumference. The entire patch was located within a 6' X 12' trapezoid of mag 10 – 11 stars with long axis oriented NE – SW.

20" f5, Dobsonian, 180X; Ken Reeves: Very faint, somewhat small, somewhat round, not much concentration. About 12 stars resolved over a very faint granular haze.

107 Aquarii

The last one is a sentimental favorite of several observers, including Gerry Rattley. This double of 5.7 and 6.7 magnitudes has nice contrasting colors. Here's the fun part, what colors do you see. And be honest!

8" f6 Newtonian, 60x, 80x & 133x: Rick Tejera: Noted the primary as bright blue with a secondary as yellow-orange. Very interesting color contrast. Easily split in the eight at 60x, 80x & 133x. The color contrast became more pronounced at higher powers, but was evident in all views.

8" f6, Newtonian, 160X; Charlie Whiting: At **160X** the primary is a 5.2 mag blue-white star. The secondary is a 6.3 mag star, also blue-white. (Hmm, no contrast.) Separation <10". PA = SE. There is only 1 other star in the FOV, an 11.5 mag star near the N edge of the eyepiece. At **60X** the double is split pretty cleanly. Three fairly bright stars are around the edge of view: To the NW is mag 5.2, 106 Aquarii. To the ESE is star of mag 9.5. To the SSE is another star of mag 8.6.

16" f4.4, Newtonian, X; Rick Rotramel: Dbl. Star - My left eye saw them as White and Light Blue.

18" f4.5, Dobsonian, 209X; Dan Gruber: This was a mag 5/6 pair with about 10" separation at PA 135°. The primary appeared white to me but the secondary had a blue tint. (Sorry, no pinky-purple this time.)

20" f5, Dobsonian, 180X; Ken Reeves: Double star easily split, I saw White and White!

Call for Observations

Since we are using digital setting circles of some sort I'll no long give directions from a bright star. If we are setup correctly there shouldn't be any problem pushing-to or going-to any of the objects. Having said that let's get to the constellation and its objects. January will find us searching around the large, but commonly over looked constellation of Pisces. Version 7.5 of the SAC database lists about 400 entries, of which we will avoid the ones fainter than mag 12.5. This gives us a selection of something like 35 objects, mostly galaxies, from which to choose. We will start with two 11.6 mag. ellipticals, namely **NGC7562** and **NGC57**. What kinds of detail do you seen in these galaxies? Next is the fainter barred **NGC182**. It is the brightest in a group of galaxies brighter than 14th mag. How many do you see in the group? Departing from galaxies is the asterism **NGC305** to which Dr. Harold Corwin of the NGC/IC Projects lists six stars, but no cluster. What is its size and stellar magnitudes? Going back to galaxies take a look at **NGC488**. It has a ring and eight faint stars. Where are the stars? Are any spiral patterns seen? Next is the M82 type **NGC520**, a peculiar galaxy. What's so peculiar about its visual characteristics? Finally there's **M74**. Need I say more? We often see it low on the eastern horizon during a Messier Marathon but now we have the chance to view it higher, much higher, in the sky. As with everything in this list, try as much power as the evening will permit to ferret out as much detail as possible.

For February we are going out on a limb for our visit to a constellation I haven't been to since January 1984. It is the southerly constellation Eridanus, which has many galaxies and one planetary. The SAC database has 337 entries with 46 brighter than 12th magnitude, but none larger than 6'. From a list of 35 entries, above the southern end of Canis Major, all but one are galaxies. From that here are the selections, in increasing R.A order. The late spiral **NGC1084**, at magnitude 10.7, is our first goal. Can you, at least, see a brighter middle? Next is the elliptical **NGC1209** at magnitude 11.4. The barred spiral **NGC1300**, along with its brighter middle follows. Does the brighter middle seem elongated to you? That's the bar! The faintest of this set, **NGC1353**, is next with its 11.4 magnitude. This is another barred spiral, but its bar should not be as prominent as the prior. **NGC1395** is amongst the brightest of the galaxies for this month, at magnitude 9.6; yet its size

(Continued on page 7)

President's Message

By Rick Tejera

Let's start by saying I hope you had a very safe & Happy Holiday Season & New Year. Mine was a bit hectic with getting the house ready, shopping and my daughter's dance competitions. Given all that was going on, I was, unfortunately unable to get out a December issue. Seems this happen at least once a year. As a result, this issue has been "Super-Sized". Both the December & January installments of Call for Observations are here, so you don't miss anything.

Also, starting out the new year, Jeff Hopkins provided an article on how he modified a Meade DSI camera to do some real scientific work from his backyard observatory. This came after a brief discussion on SAC-Forum regarding submission of material for the newsletter. Short story: feel free to contribute. I could always use some new articles and ideas. Not sure what you have to say is interesting? Let me know what you've got in mind and We can see, although frankly, I don't ever recall rejecting an article idea. Not sure your writing style is worthy of print? That's what an editor is for. Don't be shy, Help keep SACnews fresh & interesting.

Mark your calendars: The Messier Marathon is fast approaching. This years event will be March 17th-18th at the Farnsworth Ranch south of Arizona City. AJ will talk more about it at the January meeting and will have Liability Waiver forms available for those wishing to get a head start. I'll publish the form in next months issue as well.

We've had talk regarding the continued viability of Flatiron as an observing site. As most of you know the land the site is on is part of the planned Douglas ranch Development. While full scale development is still a few years away, it is already creeping up on the area. I remember when we first started using Flatiron, there were no houses much past the old racetrack on I-10. Now there are new sub-developments within 1 mile of SR85!

The general thought is that while we should still be able to use Flatiron for a while, we ought to start thinking about finding someplace else. The general criteria we looking at include:

1. A site preferably to the west. This will keep the Phoenix sky-glow east of us and allow object to rise out of the sky-glow into darker skies
2. Within about a 1 hour drive from central Phoenix. Again we're trying to keep things as close to Flatiron as possible. Much beyond 90 minutes and we may as well go to Hovatter Road.

A few possibilities have been Identified and hopefully we'll get a chance to make a few survey runs in the near future. If you have any ideas or know of a location that would fit the above guidelines, let either me or Steve Coe know about it and we'll have a look.

Next up, I be remiss if I didn't thank Susan Pritchard for Again generously hosting our annual holiday party. All who attended had a good time talking astronomy & catching up on things non-astronomy. Susan, your hospitality is greatly appreciated. Thank you.

We also need to thank Susan for her service the past year and a half as club secretary. She took over when the previous Secretary had to resign the position in midterm. Thanks to her excellent minutes, those who missed the meeting were kept apprised of the clubs doings. Thanks again, Susan!

With Elections past in November, we have a full slate of officers to begin 2007. The only addition to the board is Jennifer Polakis, who was elected (selected?) as Secretary.

Well Look here, I thought I wouldn't be able to fill the space this month.

I'll see you all at the January meeting.

HAPPY NEW YEAR, Rick

(Continued from page 6)

gives it a low surface brightness. The elliptical **NGC1400**, paired with **NGC1407**, are next. Although the latter has a brighter magnitude, their surface brightness are about the same, primarily caused by it size. Finally the planetary nebula, **NGC1535** completes the list. Try as much magnification as the evening permits along with any filters available to see what kinds of details become visible to your eye.

Beware; most of the above Eridanus galaxies have a pretty low surface brightness. Happy Hunting!

Call For Observations–Pisces

By A.J. Crayon

For the beginning of our fourth year, I want to thank our observers for their submissions, especially for last month. December is not a month were there are lots of us going out to observer because of December's activities. You deserve special thanks – even if your observations were done in past years. The author (editor?) of this column and the readers thank you for your dedication. Besides, this is a constellation that many of us don't spend much time (myself included). What a shame. Hopefully this will change our attitudes.

Another item worth mentioning, again, is the call won't give directions to locating an object from a fairly bright star. I think this is worthwhile since so many of us use some sort of electronic digital setting circles.

NGC7562

8" F6, Newtonian, 160X; Charlie Whiting: I should have observed this galaxy earlier in the evening. At 1:00 AM it was too near the horizon for a good look. It was just a round smudge, slightly brighter in the middle. It is about 2' in diameter. There were about five 13th and 14th mag stars nearby.

18" f4.5, Dobsonian, 135X; Dan Gruber: This galaxy appears round, about 3' in diameter. It has a bright stellar core with a distinct halo. Possible mag ~10 - 11 double about 10' west. Also it has two mag ~8 stars in a line pointing at the galaxy, about 8' south of it.

20" F5 Dobsonian, 180X; Ken Reeves: Pretty small, pretty faint, round, very faint halo, much brighter middle with a bright non-stellar nucleus. There is a 9th mag star to the NW and 2 to the SW. 7557 is just visible to the W.

25", Dobsonian; Peter Argenziano: This galaxy appeared round and dim with a brightening at the core. Bumping power up to **198x**, **244x** and **353x** did not reveal any additional detail except for a slight elongation running roughly east to west.

NGC57

8" F6, Newtonian, 60X; Charlie Whiting: I keyed in # 57 to the NGC catalog of my GoTo hand control and then went to find my map printout and reading glasses. As I approached my telescope I thought, "Oh, I don't want to view the Ring Nebula." For just a moment I thought I had dialed in M 57! It is just barely visible. At **160X** it is an oval smudge about 2' in diameter, aligned NE-SW. It has a stellar core. The halo is fairly bright. Just off the SW edge is a 14th mag star.

18" f4.5, Dobsonian, 135X; Dan Gruber: Round, about 3 - 4' in diameter. It has a moderately bright core with a dim halo fading into the background.

20" F5 Dobsonian, 180X; Ken Reeves: Pretty faint, pretty small, round. Extremely faint halo, somewhat brighter middle and an occasional stellar nucleus. There is a Mag 12 star to the SW. Interesting star group to the E.

25", Dobsonian; Peter Argenziano: Another rather non-descript elliptical galaxy. This little rascal was identical in appearance to NGC7562, although the core may have been a little less bright. No detail noted at **198x** or **244x**.

NGC182

8" F6, Newtonian, 160X; Charlie Whiting: this galaxy is an extremely dim and small smudge. It was virtually invisible in the glare of the 7.7 mag star just 3.5' to its NW. I had to slew the telescope to place the star off the FOV in order to confirm the galaxy's presence.

18" f4.5, Dobsonian, 135X; Dan Gruber: A diffuse round galaxy about 2' in diameter. No structure was apparent at **329X**. There are 4 additional galaxies about 30 - 40' north of NGC 182. Three of them are in an arc equidistant from NGC 182, while the 4th (westernmost) galaxy is further away. The easternmost two of the other galaxies both appear larger than NGC 182, perhaps 3 - 4' in diameter. All of the companion galaxies also are diffuse and show no structure at up to **329X**.

20" F5 Dobsonian, 180X; Ken Reeves: Pretty small, pretty faint, bright star (Mag 7 or 8) to the NW interferes significantly. Shape uncertain, bright middle, occasional stellar nucleus. **There are many other galaxies nearby that are better** (*Auth Note: Possible selections for next time Ken?)*.

25", Dobsonian, 86X; Peter Argenziano: Small, round, diffuse galaxy. Increasing magnification to **198x** and **244x** revealed that this was a face-on spiral, but no arms were detected. I counted five galaxies in the field, including NGC182. Three of the others were small and somewhat bright. The remaining galaxy was but a faint, dim smudge.

(Continued on page 9)

(Continued from page 8)

NGC305

Dr. Harold Corwin of the NGC/IC Projects lists six stars, but no cluster for this entry. Despite not knowing its exact size; here's what we see.

8" F6, Newtonian, Charlie Whiting: From my backyard in Glendale it was a dark but slightly hazy evening. I had to go to **360X** to get a confirmed look at this object. It is a small collection of 4 dim stars. Not a cluster. It maybe an asterism but isn't an open cluster. The brightest star was 11th mag. The other 3 were 12th mag. They were grouped together in a small triangle whose longest side was 2'.

18" f4.5, Dobsonian, 329X; Dan Gruber: This Y -shaped asterism consists of 4 stars in a N - S line roughly 5' long, plus a mag ~12 fifth star slightly west of the line and between the 2nd and 3rd stars in that line. The star at the north end of the main line is the brightest, about mag 10, and the star at the south end of the line is the dimmest at about mag 13. There also are two more mag ~11 stars parallel to the asterism, about 5' west and slightly north.

20" F5 Dobsonian, 180X; Ken Reeves: Very nice little group of 9 stars, 3 mag levels. Kind of shaped like Lyra, very nice in this sparse field of stars.

NGC488

8" F6, Newtonian, 38X; Charlie Whiting: Wow! Another face-on galaxy that is easily seen at low power! There is a straight line of three 10th to 12th mag stars running NE-SW with the southeastern edge of 488's halo just touching the northeastern-most star. The arrangement resembles a golf putter. At **160X** 488 has a bright nucleus surrounded by a halo of 2 levels. In moments of good seeing I think I detected spiral arms. **What a treat for an 8" scope!**

10" F4.5 Dobsonian, 100X; Ken Reeves: Somewhat bright, somewhat large, much brighter towards the middle, averted vision helps halo grow. To the ESE is a very bright star; to the S is a star in a string of 4 stars running E/W. Galaxy may show some mottling, possible spiral structure but very uncertain. It has a much brighter middle, no nucleus seen.

16" f4.4, Newtonian; Rick Rotramel - G - pS, fB, almost round, fB nucleus, with faint arms and near a bight star.

18" f4.5, Dobsonian, 209X; Dan Gruber: This galaxy has a stellar nucleus, a bright core, and a diffuse halo extending about 2' X 3'. The galaxy is just north of a line of 4 mag 10 - 11 stars.

20" F5 Dobsonian, 180X; Ken Reeves: Somewhat bright, somewhat large, roundish, very faint halo slowly and evenly brightens up to a pretty bright middle, which contains a much brighter non-stellar nucleus. Nice string of stars to the S. Bright (mag 7) star to the E interferes and is best kept out of the field. Of the companion galaxies, only one is suspected.

25", Dobsonian; Peter Argenziano: Fairly large, bright face-on spiral. At **244x** and **353x** there was a slight spiral structure detected on western edge. I did not note the 'eight faint stars or ring' as described in the Call for Observations.

NGC520

8" F6, Newtonian, 38X; Charlie Whiting: Another Wow! This galaxy is clearly visible at low power. At **120X** this is an elongated galaxy about 3' to 1', aligned SE-NW. It is fairly bright. The northwestern 2/3 of the galaxy is brighter than the southeastern 1/3. There are two 14th mag stars to the SW.

10" F4.5 Dobsonian, 100X; Ken Reeves: Somewhat faint, somewhat small, elongated 3:1 NNW/SSE. It is slightly brighter in the middle, which is also elongated same direction. Averted vision makes it grow and brings out suspected detail near ends of halo. There were no nearby bright stars.

16" f4.4, Newtonian; Rick Rotramel - G - pL, pB, elongated, an edge on spiral? This is a pretty nice galaxy.

18" f4.5, Dobsonian, 209X; Dan Gruber: This appears to be an elongated galaxy about 5' X 2' oriented roughly N - S. It looks asymmetrical, appearing brighter and wider at the north end than the south.

20" F5 Dobsonian, 180X; Ken Reeves: Little bright, somewhat large, extremely elongated 6:1 NW/SE. Faint halo, brighter middle offset to the NW side. It is almost comet shape; very nice.

25", Dobsonian, 86X; Peter Argenziano: An interesting, elongated galaxy. By the time I was observing this one some clouds had moved into Pisces. I varied the magnification from **198x** to **353x** but could not detect the dust lane noted in my field library references. I'll have to revisit this one again.

M74

8" F6, Newtonian, 38X; Charlie Whiting: Wow! This face-on galaxy is easier to see at low power than M 33! At **160X** it has a bright 1' diameter core. From the core out to the edge of the 10' diameter halo it dims gradually.

10" F4.5 Dobsonian 100X; Ken Reeves: Very large, pretty faint, much brighter middle, no nucleus noted. Spiral structure was not seen. Round. Hood doesn't

(Continued on page 10)

(Continued from page 9)
help much. Averted vision helps a little, spiral structure suspected counter-clockwise with averted vision. This is one of the dimmest M objects.

16" f4.4, Newtonian; Rick Rotramel - G - fL, fB, oval, much brighter at the nucleus, with faint spiral arms.

18" f4.5, Dobsonian, 209X; Dan Gruber: This galaxy has a large, bright, somewhat elongated core about 2' X 1'. The halo is large (about 10' in diameter) and diffuse. There is a hint of a spiral arm extending out to the south from the core.

20" F5 Dobsonian, 180X; Ken Reeves: Somewhat bright, pretty large, round, very faint halo, much brighter middle, an occasional stellar nucleus is seen. Counter-clockwise spiral structure is pretty certain. 2 faint stars involved, 7 brighter stars nearby.

25", Dobsonian, 86X; Peter Argenziano: In comparison to the other galaxies observed, M74 would qualify as large and bright. It appears as a large, diffuse face-on spiral with a hint of one large arm. Increasing the magnification to **198x**, **244x** and **353x** revealed significant detail in the spiral structure. It is nice to have a look at this beautiful galaxy when it's not sinking into the western horizon for a change (Yup, isn't it the truth!).

Call for Observations

It seems the time has flown by, in the four years, with this column. I very much enjoy collecting the observations and putting them together for all to see. I keep hearing compliments that are much appreciated. But if you do have suggestions for improvements, please speak with me.

For February we are going out on a limb for our visit to a constellation I haven't been to since January 1984. It is the southerly constellation Eridanus, which has many galaxies and one planetary. The SAC database has 337 entries with 46 brighter than 12th magnitude, but none larger than 6'. From a list of 35 entries, above the southern end of Canis Major, all but one are galaxies. From that here are the selections, in increasing R.A order. The late spiral **NGC1084**, at magnitude 10.7, is our first goal. Can you, at least, see a brighter middle? Next is the elliptical **NGC1209** at magnitude 11.4. The barred spiral **NGC1300**, along with its brighter middle follows. Does the brighter middle seem elongated to you? That's the bar! The faintest of this set, **NGC1353**, is next with its 11.4 magnitude. This is another barred spiral, but its bar should not be as prominent as the prior. **NGC1395** is amongst the brightest of the galaxies for this month, at magnitude 9.6; yet its size gives it a low surface brightness. The elliptical **NGC1400**, paired with **NGC1407**, are next. Although the latter has a brighter magnitude, their surface brightness are about the same, primarily caused by it size. Finally the planetary nebula, **NGC1535** completes the list. Try as much magnification as the evening permits along with any filters available to see what kinds of details become visible to your eye. Beware; most of the above Eridanus galaxies have a pretty low surface brightness. Happy Hunting!

Although there are a finite number of constellations, 88, and even fewer to be seen from Arizona there are some that we haven't visited. For March we will be able to scratch another from that list, for we will take one of several visits to Camelopardalis. There's quite a list of deep sky objects with a magnitude of 12 or brighter and for this excursion we'll stay with just seven of them. You shouldn't have much trouble hunting these down in modest size telescopes so let's get to the list. Starting with the western most, and continuing to the ease, we'll start with **Stock 23**, also known as Pazmino's Cluster that has about 25 stars in a 15' area and, to save you some time just in case, it is located at RA 03 16.2 dec. +60 06. Next is **Collinder 464**, located at RA 05 12.6 dec. +73 58, with 50 stars in a 120' area. Compare and contrast these two clusters. A couple of hours of right ascension later is the magnificent spiral galaxy **NGC2403**. See how much detail you can coax out of its spiral arms and its middle. Now the toughest of the lot is from the Morphological Catalog of Galaxies **MCG +13-07-007** where the SAC database indicates its *inner regions are very black*. You probably won't be able to see this because this galaxy is 12th magnitude and less than 1'. It is located at RA 08 53.2 dec. +76 30. Think of it this way – now you've seen something in the MCG! Moving right along we now get to **NGC2655**, finally something in the NGC. This barred spiral is bright and large; see what details this one has for us. **NGC2715** is another barred spiral, not quite as bright but elongated. Finally we get to **IC 3568** a surprising planetary nebula with a magnitude 12.9 central star. I have no record of color being detected. Do you see any?

(Continued from page 3)

case. The camera can be used without a cooler, however, cooling the CCD will not only increase its sensitivity, it will reduce the noise or dark counts considerably. This modification can be simple or complex depending on your skill and desire. I found the simplest approach works well. This requires a minimum amount of work and modification to the camera. The camera must be taken apart, however, and doing this will void any warrantee.

Figure 4 shows the disassembled camera. Ideally just the cold finger (the protrusion with the white thermal grease on the end that rests against the back of the CCD chip to transfer heat away from the chip) would be cooled directly. This makes the modification much more complex, however. I found just mounting the TEC with lots of thermal grease, to the back of the camera case works fine. The whole camera gets cooled, but the most cooling will occur directly under the TEC which goes directly to the cold finger and CCD chip.

Figure 4-Inside the DSI Pro with Cold Finger shown

To mount the TEC unit with heat sink and fan drill two clearance holes (6-32) in the back of the camera case and two corresponding holes for tapping in the heat sink. Do not drill into the TEC. The heat sink holes will need to be tapped for the 6-32 screws. Use 6-32 nylon screws to minimize the heat transfer back to the case. The exact position of the screws is not critical. Four screws can be used if you want a more secure attachment, but I found two work fine. Be very generous with the thermal grease both between the TEC and camera back and between the TEC and heat sink. See Figure 5.

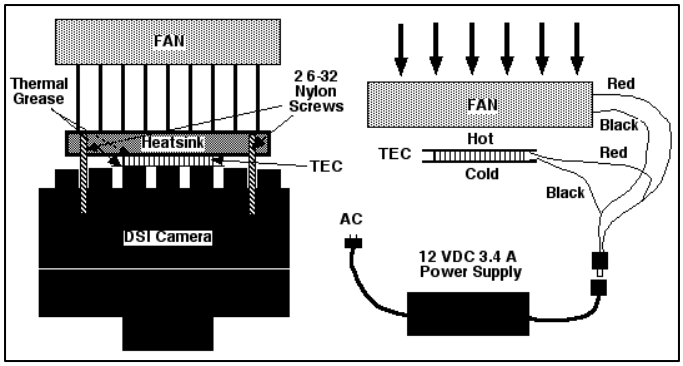

Figure 5-Modification and Electrical Drawing

A 40 mm square TEC (also known as a Peltier Junction), heat sink and fan can be purchased from All Electronics for $12.75 (PJT-6) and $7.50 (fan and heat sink unit CF-215). http://www.allelectronics.com

A 12 to 15 VDC @ 3 to 5 amp power source will be needed. Batteries can be used, but the high current will drain them up quickly. There are many options for the power source. While it must be DC power, regulation is not critical as the load remains constant. The TEC has a maximum rating of 16 VDC @ 5.6 amperes.

Next a filter wheel with standard BVRI photometric filters is needed. I found the ATIK manual filter wheel ($199.00 ATK-FW125) from Adirondack Video Astronomy (http://www.astrovid.com/) to be well made and reasonably priced. Automated wheels can cost up to around $1,000. The filter wheel can hold 5 - 1.25" filters. I purchased a set of BVRI photometric filters ($300) from Astrodon (http://www.astrodon.com).

Next, while not essential, but useful, is the addition of a focal reducer. I used a Meade F 3.3 focal reducer. The

(Continued on page 14)

Monthly Trivia Question

Easy one this month: According to then SAC DB, how many non-Galaxy Deep Sky objects are there in Virgo?

Answer next month.

Answer to last months question:

What aspect of Yuri Gagarin's spaceflight was kept secret until after the fall of the Soviet Union for fear that the USA would claim that his achievement didn't count as the first man in space?

A: The fact that he bailed out of his spacecraft after re-entry, prior to touchdown. It was feared that he wouldn't survive the actual landing, so he bailed out at about 60,000 ft.

2007: A Year of Sky Events

by Joe Orman

Mark your calendar for these interesting alignments, conjunctions, occultations & meteor showers in the year 2007. Times are calculated for Phoenix, Arizona; other locations may differ. Most will be easy to see with the unaided eye, some very challenging -- take a look! Constructive comments and corrections welcome. This list may be copied and distributed for non-commercial use, but it must be credited to Joe Orman.

- **January 2-3** (night): Major lunar standstill: full Moon passes nearly overhead, only 6 degrees away from zenith at about 12:15 a.m.
- **January 15** (morning): Bright star Antares 1 degree to upper left of crescent Moon as they rise in SE about 4:30 a.m. (occultation for southern South America), Jupiter 5 degrees to upper left.
- **January 20** (evening): Venus 3 degrees to lower right of crescent Moon, low in WSW after sunset (occultation for southern Africa).
- **February 7** (evening): Mercury at Greatest Elongation, visible for about a week around this date above twilight, low in WSW after sunset. Venus 7 degrees to upper left.
- **February 19** (evening): Venus 5 degrees below crescent Moon, in W after sunset.
- **February 23** (evening): First-quarter Moon 2 degrees from Pleiades star cluster, near zenith after sunset (occultation for northeast North America, northwest Europe).
- **March 15** (morning): Mars 7 degrees to left of crescent Moon, low in SE before sunrise. Mercury 15 degrees to lower left of Mars. Moon between Mars and Mercury on March 16.
- **March 20**: Spring equinox (5:07 p.m. MST). Sunrise straight east (6:32 a.m., azimuth 89.6 degrees), sunset straight west (6:40 p.m., azimuth 270.6 degrees). Always use proper eye protection when viewing the sun.
- **March 20** (evening): Venus 7 degrees to upper left of crescent Moon, in W after sunset.
- **March 22** (evening): Pleiades star cluster 3 degrees below crescent Moon high in W after sunset, within 0.5 degrees as they set in WNW about 11:30 p.m. (occultation for northeast North America, northwest Europe).
- **March 28** (evening): Saturn 0.5 degree from gibbous Moon, very high in ESE after sunset (occultation for Greenland & Iceland).
- **April 14** (morning): Mars 7 degrees to upper right of crescent Moon, low in ESE before sunrise.
- **April 19** (evening): Crescent Moon between Venus and Pleiades star cluster, 5 degrees from each, in W after sunset (Moon occults Pleiades for northeast Europe).
- **April 25** (morning): Saturn 1 degree to upper left of first-quarter Moon, as they set in WNW about 2:30 a.m. (occultation for northwestern Canada and Alaska).
- **April 26** (morning): Gibbous Moon occults bright star Regulus (disappears behind dark edge just minutes before they set in W about 3:00 a.m. MST) (occultation more easily seen in northwestern North America).
- **May 19** (evening): Venus 1 degree to lower left of crescent Moon, in W after sunset.
- **May 22** (evening): First-quarter Moon between Saturn and bright star Regulus, 5 degrees from each, high in WSW after sunset (Moon occults Saturn for parts of Europe, Africa, Asia).
- **May 31** (evening): Jupiter 7 degrees straight to left of full Moon, as they rise in SE about 7:45 p.m.
- **June 1** (evening): Mercury at Greatest Elongation, visible for about a week around this date above twilight, low in WNW after sunset. Also follow line through Venus and Saturn higher in W, across to Jupiter low in ESE.
- **June 13** (morning): Very thin crescent Moon occults Pleiades star cluster, low in ENE before sunrise, Moon entering cluster as they rise about 3:30 a.m.
- **June 17** (evening): Crescent Moon, Venus, Saturn, and bright star Regulus in line, about 10 degrees between each, in W after sunset. Moon between Venus and Saturn on June 18.
- **June 19** (daytime, evening): Thick crescent Moon occults bright star Regulus, high in SW in late afternoon (disappears behind dark edge about 5:00 p.m. MST, reappears from behind bright edge about 6:25 p.m.). After sunset, Regulus 1 degree to right of Moon, high in W.
- **June 30** (evening): Saturn 1 degree above Venus, in W after sunset.

2007: A Year of Sky Events

by Joe Orman

- **July 11-12** (evenings): Bright star Regulus 2 degrees above Venus, low in W after sunset. Saturn 5 degrees to lower right.
- **July 16** (evening): Venus and bright star Regulus 5 degrees to upper left of crescent Moon, Saturn 2 degrees to lower right of Moon, low in W after sunset.
- **August 6-7** (night): Pleiades, Mars and thick crescent Moon in triangle 6 degrees apart, rising in ENE around midnight (Moon occults Pleiades for western Europe).
- **August 12-13** (night): Perseids meteor shower. New Moon will not interfere. Shower radiates from constellation Perseus, which rises in NE about 10 p.m. Best time to look between midnight and morning twilight. Typical rate 50 meteors per hour.
- **August 28** (morning): Total lunar eclipse, in SW before sunrise (partial phase starts 1:51 a.m. MST, totality from 2:52 a.m. to 4:22 a.m., partial phase ends 5:23 a.m., Moonset 6:10 a.m.).
- **September 1-3** (mornings): Saturn 1 degree from bright star Regulus, very low in ENE before sunrise.
- **September 2** (evening): Moon occults Pleiades star cluster, low in ENE after sunset, Moon entering cluster as they rise about 10 p.m.
- **September 9** (morning): Venus 10 degrees to upper right of crescent Moon, Saturn and bright star Regulus 7 degrees below Moon, low in E before sunrise.
- **September 21** (evening): Bright star Spica 0.5 degree to left of Mercury, extremely low in W after sunset.
- **September 23**: Fall equinox (2:51 a.m. MST). Sunrise straight east (6:17 a.m., azimuth 89.5 degrees), sunset straight west (6:24 p.m., azimuth 270.3 degrees. Always use proper eye protection when viewing the sun.
- **September 30** (morning): Pleiades star cluster 1 degree from gibbous Moon, near zenith before sunrise (occultation for parts of Asia).
- **October 7** (morning): Saturn 1 degree to left of crescent Moon, Venus and bright star Regulus 5 degrees to upper right, in E before sunrise.
- **October 14-15** (mornings): Saturn 3 degrees to upper left of Venus, bright star Regulus 5 degrees above, in E before sunrise.
- **November 3** (morning): Thick crescent Moon occults bright star Regulus, in E before sunrise (disappears behind bright edge about 3:38 a.m. MST, reappears from behind dark edge about 4:44 a.m.).
- **November 5** (morning): Venus 3 degrees to left of crescent Moon, in ESE before sunrise.
- **November 7** (morning): Mercury 10 degrees to lower left of thin crescent Moon, bright star Spica between them, low in ESE before sunrise.
- **November 17-18** (night): Leonids meteor shower. First-quarter Moon setting around midnight will not interfere. Shower radiates from constellation Leo, which rises in E about midnight. Best time to look between midnight and dawn. Typical rate 20 meteors per hour, some years much higher.
- **November 24** (morning): Full Moon grazes Pleiades star cluster, low in WNW before sunrise (occultation for northern North America, northern Asia).
- **November 26** (evening): Mars 1 degree to lower right of gibbous Moon, rising in ENE about 7:30 p.m.
- **December 5** (morning): Venus, crescent Moon and bright star Spica make triangle 7 degrees apart, in SE before sunrise.
- **December 13-14** (night): Geminids meteor shower. Crescent Moon setting about 9 p.m. will not interfere. Shower radiates from Castor in constellation Gemini, which rises in NE around 7 p.m. and is near zenith in early morning hours. Best time to look between 9 p.m. and dawn. Typical rate 60 meteors per hour.
- **December 21** (evening): Pleiades star cluster 2 degrees to upper right of gibbous Moon, high in E after sunset (occultation for northeast North America, northern Europe).
- **December 23** (evening): Mars 1 degree below full Moon as they rise in NE about 5:00 p.m. (occultation for northwestern Canada). Mars is only 1 day before opposition, so should be bright enough to see close to full Moon.

Joe Orman's Photo Pages: joeorman.shutterace.com

(Continued from page 11)

wider field of view makes finding fainter stars much easier. In some cases, e.g., with theta Orionis), the focal reducer is not used so maximum star separation can be obtained in the image. See Figure 6 for the modified camera.

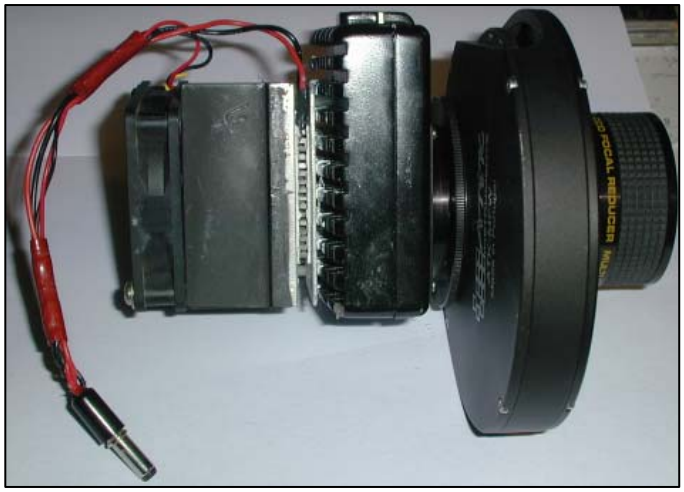

Figure 6-Modified DSI Pro with filter wheel and F3.3 Focal Reducer

Once the camera is modified, wrapping it in foam will keep the camera cooled and insulated from ambient temperature. This works surprisingly well. Figure 7 shows the modified camera with the insulating foam.

Figure 7-Modified DSI Pro with Foam Insulation

Software

To be useful a CCD camera must have good software to control it. While there are several different software packages available for imaging, telescope control and photometry, the AutoStar software that comes free with the DSI Pro is excellent. On a scale of 1 to 10 (10 being best) I would rate the software close to the 10, but the documentation around 2.

The AutoStar software has a very nice planetarium program built-in. Stars down to around 15th magnitude can be seen. The program works with a computer to allow control of the telescope. Once aligned, just putting the cursor on a star and selecting slew will take you to the star with surprising accuracy. AutoStar also provides some excellent features for controlling the camera. Images can be aligned and stacked. De-rotation of alt-az mount images can be done. Dark frames can be automatically subtracted. Sequences can be setup to take images throughout the night automatically. AutoStar can also be used to autoguide the telescope. While there are certainly better image processing software packages, AutoStar does an excellent job on that too. In addition you can do photometry on the images with AutoStar. All this will take some learning, practice and digging through the .pdf documentation and help files, but it will be worth it.

Photometry with the DSI Pro

One of the first projects with the modified camera was photometry of the long period eclipsing binary star system EE Cephei. This star system is very suitable for the CCD as the comparison stars are all close and the formation is easily identified. I was very apprehensive about this project as I could not see the stars (11th magnitude) visually through the main optics. I was delightfully surprised when the star field came into view with just a 0.5 second exposure. This made finding, focusing and centering very easy.

Figure 8 shows images of the EE Cephei stars through the B and I photometric filters. As can be seen, some stars are much brighter in one band than the other. Even where the stars are hard to see in the figures, it was still possible to do good photometry on them.

Conclusion

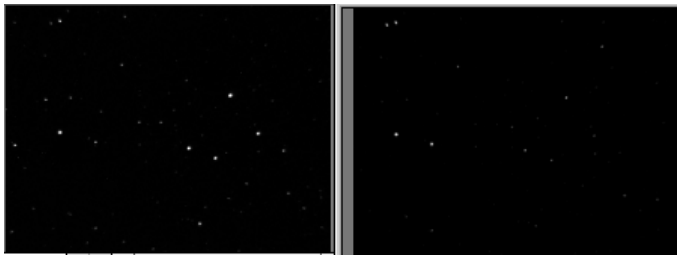

Figure 9-30 Second CCD Images of EE Cephei with B and I Filters

For those interested in doing some Real Science with their telescope, for under $1,000 you can add a CCD camera system capable of high quality BVRI photometry. For more information on doing CCD photometry check the AAVSO CCD Manual at http://www.aavso.org/observing/programs/ccd/manual/.

Give it a try. Doing successful photometry ups the enjoyment level of astronomy a couple of notches.

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SAGUARO ASTRONOMY CLUB

5643 W. Pontiac Dr
Glendale, AZ 85308-9117

Phone: 623-572-0713
Fax: 623-572-8575
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January 2007

Videmus Stellae

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SAC Schedule of Events 2007

SAC Meetings

January 5th, 2007	July 27th, 2007
February 2nd, 2007	August 24th, 2007
March 2nd, 2007	September 28th, 2007
April 6th, 2007	October 26th, 2007
May 4th, 2007	November 16th, 2007
June 1st, 2007	December, 2007
June 29th, 2007	Holiday Party-TBA

Special Events

March 16th-17th, 2007	All Arizona Messier Marathon
June 15th-16th, 2007	5 Mile Meadow Star Party
November 9th-10th, 2007	Sentinel Schwaar Stargaze

SAC Star Parties

Date	Sunset	Astronomical Twilight Ends	Moonrise	Site
Jan 13th, 2007	1725	1854	0336	F
Feb 10th, 2007	1811	1935	0223	F
Mar 10th, 2007	1835	1958	0112	F
Apr 14th, 2007	1901	2029	0447	F
May 12th, 2007	1927	2059	0311	C
Jun 9th, 2007	1940	2125	0140	C
Jul 7th, 2007	1944	2128	0013	C
Aug 11th, 2007	1920	2054	0522	C
Sep 8th, 2007	1845	2011	0415	C
Oct 6th, 2007	1809	1932	0314	F
Nov 3rd, 2007	1737	1902	0207	F
Dec 1st, 2007	1723	1851	0057	F

F= Flat Iron; C= Cherry Road