SVAS OBSERVER
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Sacramento Valley Astronomical Society
Founded in 1945

Winter at HGO

Henry Grieb Observatory looks so peaceful during the winter, serene, and relaxed, especially with the sun just setting! The snow covered ground looks deceptively shallow in depth, and it seems to extend the horizon covering up all the objects that usually define distance like the tarmac and airport runway. The snow absorbs a lot of stray sound and conveys a restful quiet. That mood is only from the outside, inside there's a lot going on. There are some unsung heroes working like elves on the inside!

There are two SVAS members, Gary Shuluk & Stuart Schultz, who have been working hard keeping HGO in good repair and in working order. Stuart was the SVAS Observatory Director for many years. I requested some pictures, and they both sent some great ones! Gary sent this one with the snowman, I sent it back saying the snowman needs a telescope. When Gary added the telescope, I then complained it was a refractor and not a reflector (Kidding). Perry P. Porter and I spent last Tuesday with Stuart, helping to adjust the dome limit switch, removing the rest of the front swipe lock for repair, and

> Unsung Heroes are working like elves inside HGO!

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Inside This Issue page

Vice Presidents Perspective

by Walt Heiges

We are entering into yet another year with many events in our future. 2013 will hold a series of ideas developed by a committee charged with creating an exciting new direction for the SVAS. Richard Sandler, korit7@yahoo.com , is the Chair for this committee. He will be taking any and all suggestions from members wanting to see a new direction for the activities of SVAS and developing them into a plan. Now is the time to point us into a future that you desire. What do you want to see us do with the public outreach program, etc? If you have a talk or presentation for our monthly meeting, Richard is also our "Speaker Seeker".

For this outreach program, we will need more volunteers. I want to see the SVAS out in the Sacramento area promoting Astronomy everywhere in the valley. I want to see more solar events scheduled at coffee shops and strip mall parking lots everywhere. Be bold and just go out there and view. I live next to a bike trail that is used by State workers who walk during their breaks. Come join me. What a perfect place for Astronomy. Your talents will be admired by the general public.

We are starting a loaner program for telescopes. Tim Tingey, timmanyatingey@yahoo.com , will be setting up a program where members can check out one of our loaner telescopes for personal use. Stay tune for those details to be published in the Observer and on the web site. Tim is also point contact for the winter site used for observing at Prairie City SVRA. He also has plans to create a Messier Marathon Group for members to experience the thrill of finding all 110 (109?) objects.

Comets will soon be very popular so we need to be out there. As they approach, the public will become aware and want to take a peek at them. You all have the equipment and knowledge. I'm constantly receiving calls from the local TV stations wanting to know where we are set-up for viewing. This last meteor shower, Alpha Aurigids, prompted calls from Channels 3, 10, and 40, asking for our participation. Liam McDade took Channel 10 to Sac City's Observatory for a view. If nobody (SVAS) is going to participate, then I must tell them we aren't interested. I will be disappointed, they will be disappointed, and the public will be disappointed. They look to the SVAS to get a real-time view of the stuff they read about. We possess the ability to show them those views and I don't want to deny them that pleasure.

> "I want all of you to stand next to me when the public is curious. We need to go everywhere the public wants us to be."

We have over 150 members, yet only 30-40 of you attend our meetings at Sacramento City College. We send out e-mail notices with our newsletter (Observer) to those 150 members yet only 74% of you open it and actually read it. However, the readership is up 8.7% from 2011! That means 26% of our members must just delete the Observer and never read all that great news. I don't understand that discrepancy, you would think all members would want to read the current events? Lonnie Robinson, lonrobie@surewest.net , is doing his very best to present a great bimonthly newsletter. We are working towards a 100% readership! If there is anything we can do to improve the Observer, let Lonnie or me know so we can get it done.

I want the SVAS to go to the next level. We need to go everywhere the public wants us to be. Sacramento should know who we are and what we can provide. I want all of you to stand next to me when the public is curious.

SVAS Event Calendar

March 9-10, Saturday Eve & Sunday Morning

Messier Marathon initial training session at Prairie City. Contact Perry Preston Porter or Tim Tingey.

See page 4.

March 11

New Moon

March 15th, General Meeting, Friday at 8:00pm

SVAS Election Meeting! There won't be a speaker scheduled this month. This is your chance to make your vote count for the officers and directors of your choice. Please attend this very important yearly event!

Sacramento City College, Mohr Hall Room 3, 3835 Freeport Boulevard, Sacramento, CA.

March 30th, Telescope Workshop

Mirror cleaning and collimation. Our large sinks and water sprayer, make cleaning big mirrors safe and easy. Drop by and let's talk telescopes.

Alonzo's Pizza Depot, 7054 Sunrise Blvd, CH, CA., 12-3pm, enter at back door.

April 10

New Moon

April 12-13, Friday & Saturday

Star Party at Prairie City. Contact Perry Preston Porter or Tim Tingey. Hopefully more Messier Marathon training!

April 19th, General Meeting, Friday at 8:00pm

Bill Goff will be our speaker, he is an avid variable star observer from his backyard observatory in Sutter Creek. He will describe recent photometry of a Cepheid type variable star in Andromeda, that Hubble used to establish the great distance of this Galaxy.

Sacramento City College, Mohr Hall Room 3, 3835 Freeport Boulevard, Sacramento, CA.

April 27th, Telescope Workshop

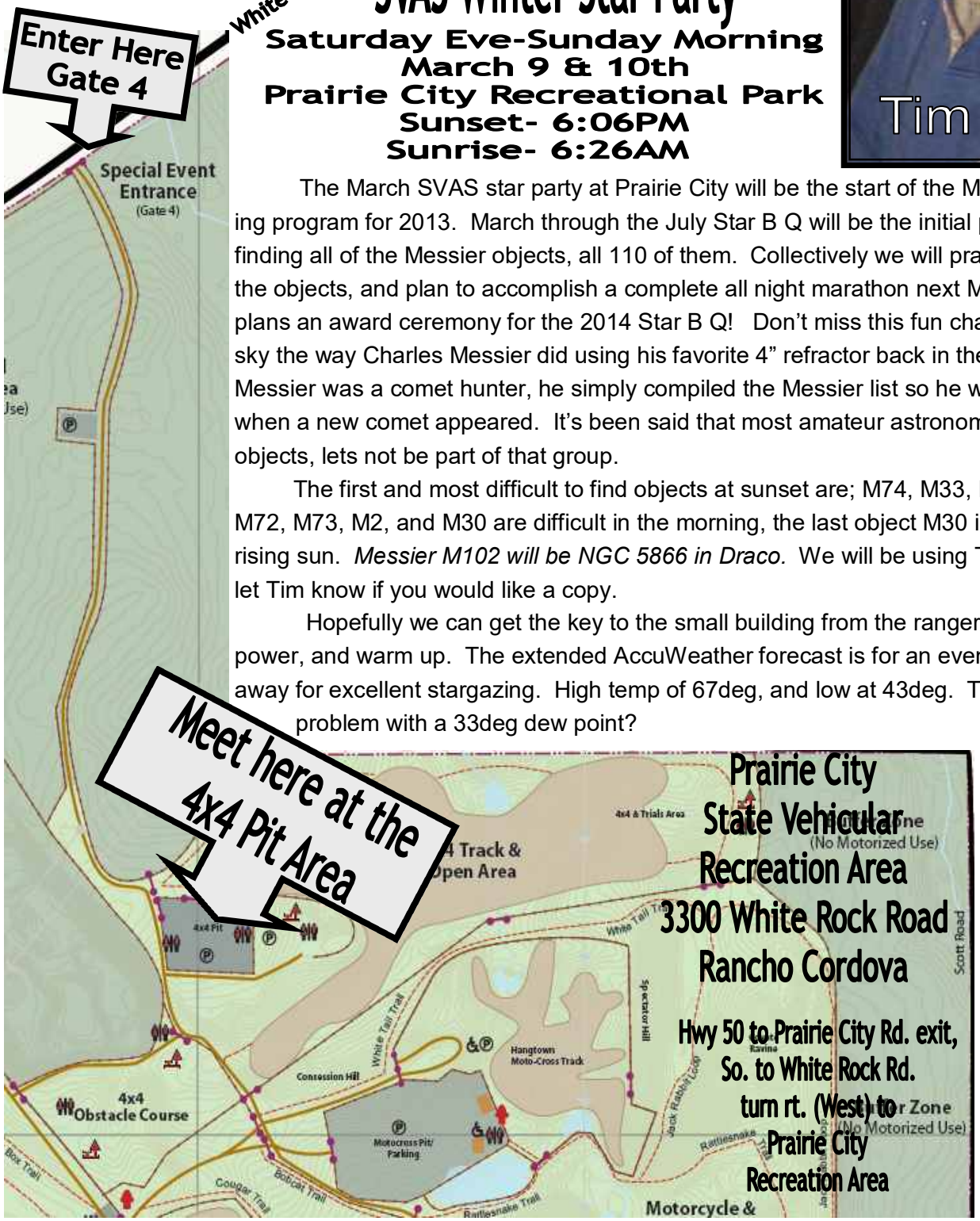
Mirror cleaning and collimation. This is a great chance to get your equipment cleaned and tuned up for the summer viewing season! After this workshop, please contact Lonnie or Bill for individual help with mirror making or telescope building.

Alonzo's Pizza Depot, 7054 Sunrise Blvd, CH, CA.
12-3pm, enter at back door.

Messier Marathon

SVAS Winter Star Party

Saturday Eve-Sunday Morning
March 9 & 10th
Prairie City Recreational Park
Sunset- 6:06PM
Sunrise- 6:26AM



The March SVAS star party at Prairie City will be the start of the Messier Marathon training program for 2013. March through the July Star B Q will be the initial period to complete finding all of the Messier objects, all 110 of them. Collectively we will practice finding on all of the objects, and plan to accomplish a complete all night marathon next March, 2014. SVAS plans an award ceremony for the 2014 Star B Q! Don't miss this fun chance to learn the night sky the way Charles Messier did using his favorite 4" refractor back in the 1700 and 1800s. Messier was a comet hunter, he simply compiled the Messier list so he wouldn't be confused when a new comet appeared. It's been said that most amateur astronomers never see all 110 objects, lets not be part of that group.

The first and most difficult to find objects at sunset are; M74, M33, M110, and M77. M55, M72, M73, M2, and M30 are difficult in the morning, the last object M30 is the toughest with the rising sun. *Messier M102 will be NGC 5866 in Draco.* We will be using Telrad Messier charts, let Tim know if you would like a copy.

Hopefully we can get the key to the small building from the rangers, for restrooms, power, and warm up. The extended AccuWeather forecast is for an evening shower clearing away for excellent stargazing. High temp of 67deg, and low at 43deg. The dew shouldn't be a problem with a 33deg dew point?

Contact Tim Tingey at Timmanyatingey@yahoo.com, and let him know if you can make it! It takes a huge effort to get this program going, so please support Tim for a fun evening learning to star hop the night sky! All skill and equipment levels welcome!

SVAS Editor

Winter at HGO from page 1: securing the moisture damaged ceiling tiles in the warm up room. Stuart designed and built new wooden stairs reaching into the dome of RJMO. It's still a bit tight going up, so we planned to move them forward about six inches, and up a couple inches to center the upper and lower risers. Notice the dark brown paint in the dome itself. It just looks great finally finished!

The dome control room is finished too. Finally a doorframe, some trim and new paint on the walls. Check out the planets on the doorframe. Please forgive the construction tools, we haven't finished cleaning up yet. I remounted the ceiling tiles in the warm up room, getting them ready for paint in the next few weeks. The ceiling paneling in the coffee room is falling off too because of a leaky roof. That needs repair soon! Finally, we will work on the observation deck area. There is water damage there too, and it needs a bit of fresh paint.

Don't tell anyone, but we have a very talented artist in our group. Stuart painted, in my opinion, a really great abstract mural of RJMO being assembled! Being my usual shy self, I suggested he do a mural on a wall in HGO's observation deck. I could see the wheels turning in his head during the brief silence that followed. I will consider it, he said. I suggested one condition, that Perry and I are in the picture! Just kidding, but perhaps we could think of some very deserving members who should be there.

Per my request, we walked past the fire station (it isn't a fire station any more, just storage), down the road to the Y, and went right for a block or so looking for a water pump that supplied water to the old restrooms. The blanket of snow was deep enough to prevent it's discovery. Of all the great things we could accomplish at HGO, restrooms would be very high on my list. The SVAS powers that be have assured me that a restroom project would be far too expensive. However, we are spending big dollar$ for Porta Potty rentals that could go a long way towards financing restrooms. I suggested they be built on the back side of HGO, and Perry

thought they would fit nicely to the left of the front door forward of RJMO. I agreed! The entry could be at the far left end of the commissary (coffee) room? A water supply is badly needed for all sorts of things from restrooms to landscaping. A small plot of grass and a few shrubs would look stellar! (Do I need to say pun intended?) Perhaps I'm just "night"-dreaming, but you've got to crack some eggs to make an omelet.

I noticed some great drawings in HGO's logbook. The pictures tell the story, without reading the notes, of how a tree fell across the road and was leaning against the large pine on the other side. the notes tell of trimming the fallen tree back for access. The second note just touches on the swipe keyless lock failing. There was no access to HGO, and breaking in was the only option. That was accomplished with as little damage as possible, considering how well built the observatory is. The lock is being repaired as I speak.

The photo at the bottom is Perry scratching his head over the removed lock assembly. The last photo is Stuart securing the lock holes with a temporary cover.

We stopped for lunch about midday, and enjoyed a bit of relaxing conversation. It was really fun and informative talking with a past director who has so much knowledge to share. We made tentative plans to meet again, to paint the warm up room and get things cleaned up for this years viewing season. Perry is going to evaluate all the stuff that has accumulated in the observatory over the years, and reduce it down to what we really need. I'm in the process of finishing up a pair of wheel barrel handles for the big 16" Dob at HGO. It will make it easy for members to roll it out to the tarmac, and get in some big aperture viewing. It really needs a good mirror cleaning and collimation too! I was going to carry the dirty mirror out with us when we left, but the snow was only lightly crusted over providing less support than necessary for any extra weight.

I'm beginning to think there is a whole other world out there with astrophotography, especially in the winter, that I've missed. I gave up this part of our hobby years ago trying in vain to succeed with 35mm film. Digital cameras have revolutionized taking celestial photos.

This was my first trip to HGO in the winter, and it was most enjoyable! It brought me back to my childhood in northern Utah, taking in the winter scene. I use to drag my inexpensive telescope out in some of the coldest weather, and always thought the views were the very best during those crisp, crystal clear nights. I will be looking into some new snow shoes for the short hike from the fire station parking lot to HGO. A whole new sky awaits…

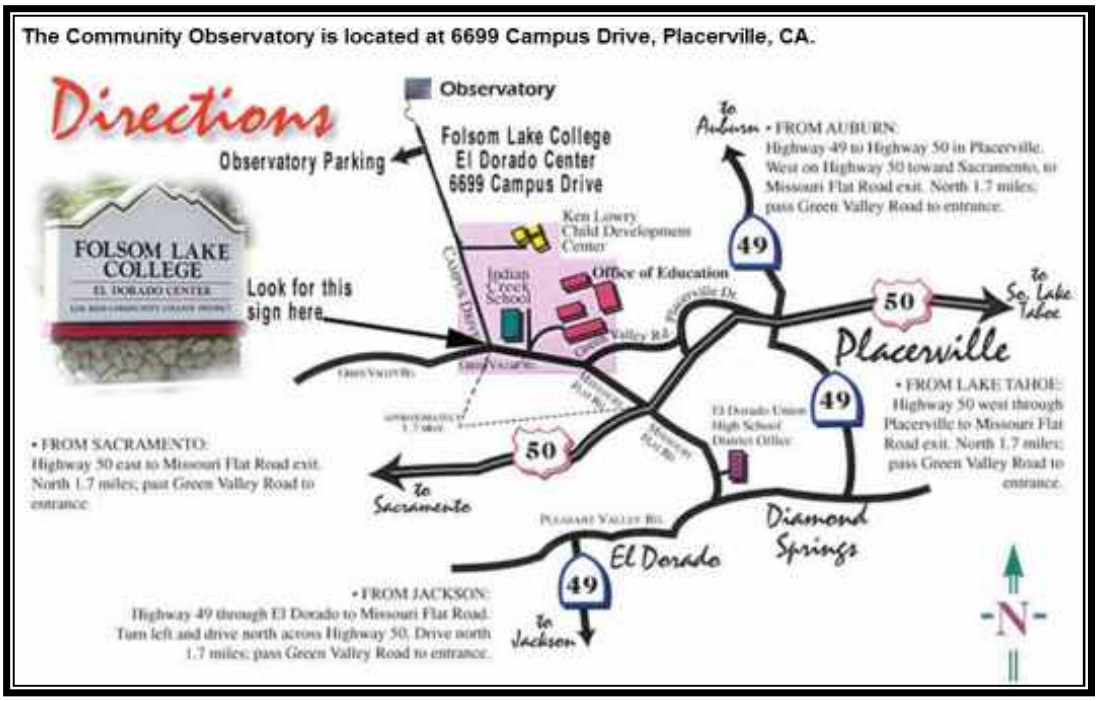
Here is Stuart's abstract mural mentioned in the article. I am most impressed how well it tells the story of RJMO being built. I am not an art expert by any stretch of the imagination, but I know I enjoy this immensely. Check out the upper left hand corner, there is a rendition of the water pump, and the restrooms are there too. Notice the strange guy at the left who lived in the old airport house, intently and suspiciously watching the progress.

Observer Editor

Visiting Forrest Lockhart at the Cameron Park Rotary Community Observatory

by Lonnie Robinson

The date was Monday, January 21, 2013. Bill Thomas and I were at it again, acting as the unofficial ATM ambassadors. This time Dave Buchla, Chuck Real, and Tim Tingey, accepted our invitation to join us for a fun evening visiting the Cameron Park Rotary Community Observatory with our Docent host Forrest Lockhart. I suggested to Forrest that he write an article for us, but he ask me to describe my own impressions of the new facility.



WoW!! Ok now you have my impression, let me describe our really fun evening. We had no trouble locating Folsom Lake College, and followed the directions to the observatory parking lot. It was getting dark and the road up the hill looked blocked, so we stopped for a moment to read the map again. All we needed to do was drive straight through the partially closed gate and up a short hill. The short winding road was bordered by landscaping work in progress, it's going

to look like a park. We should have arrived earlier so I could have snapped some pictures of the complete picturesque setting on top of a gentle rolling hill. Forrest and fellow docents Pat & Gene were there to greet us. After introductions and a few pictures, Chuck and Tim arrived and we all walked a short distance down the hill to the outdoor 40 seat astronomy "Sky Theater". We wanted to see it before complete darkness, so we could get a feel of the whole project. The Cameron Park Rotary Club dug out and built the theater by hand. They had a rough drawing to go by, and a great example to follow from the Bidwell Park Observatory in Chico. Starting with a vertical post in the center, they rotated a string to find the circular dimensions as they dug out the seating area. The cement covering looks a lot like gunite in a swimming pool. While they were at it, they should have installed water jets for a very large Astro hot tub! The evening was getting cool, and the still warm cement felt great to lay back on. Sitting there with our heads just below the ground level with the steel railing framing the isolated sky, reminded me of a indoor planetarium. My thoughts wandered to how much fun we could have with an Astro Theater of our own at HGO!

After enjoying a few relaxing minutes contemplating the twilight sky, we assembled in the observatorie's classroom-like main entry room to listen to Forrest's great presentation. He unfolded the story of how the observatory came to be from the beginning. The concept was to give the general public first priority, with schools a close second. The original funding of 185K came from the Rotary club, Folsom Lake College/El Dorado Center, and the El Dorado County Office of Education. The board of Education donated the property. It was immediately discovered that public insurance would be a major expense, and the College came to the rescue by extending their umbrella coverage to the observatory. **They had 901 visitors for the Venus Transit alone!** Sac State, Sac City college, Consumes River College, and American River College all bring their astronomy classes to enjoy the facility from

time to time. With all these users, having the insurance provided helped immensely. The Board of Education has continued to support the observatory with funds for the new restrooms and high end equipment.

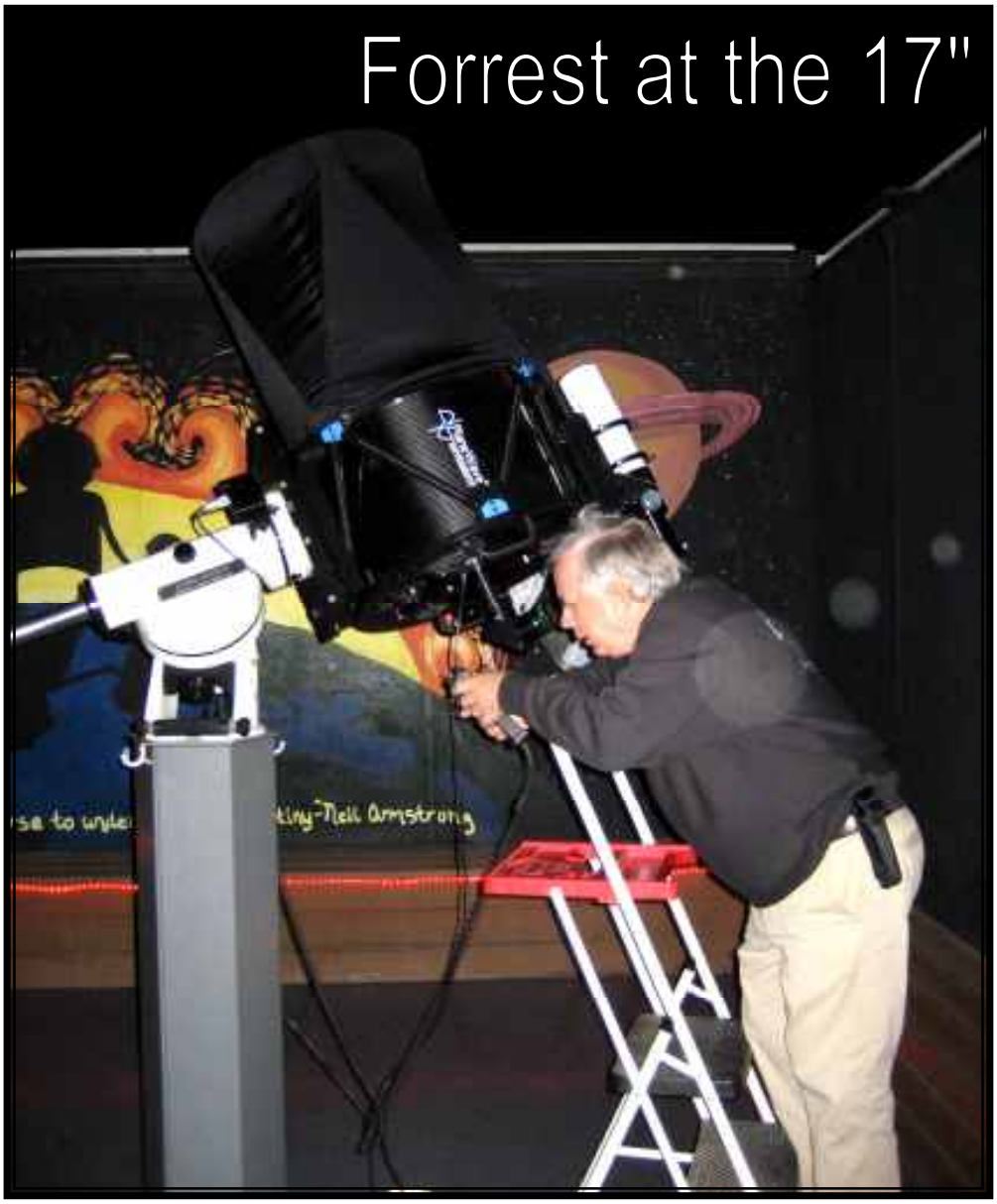
The restrooms are fantastic! OK, please don't think I'm a restroom fanatic, but when HGO is still using Porta Potties they are a very big deal indeed. They are about 10'x10' in size complying with all the ADA wheelchair requirements and sized for large crowds. They even had red rope lights inside to preserve our night vision! There is a small equipment storage room on one end.

Before I tell the story about the new telescope, let me talk about Forrest Lockhart. His name is very familiar in the SVAS. He has led the SVAS Messier marathon group for years, served on the SVAS Board of Directors, major newsletter contributor, and last but not least ran the Bar-B-Q grill at our Star-B-Q each year. He recently formed an observing group called the Sierra Stargazers. I would like to share a great story told by Forrest, about his early ATM experiences as a very young boy in Los Angeles:

"*I had figured my first 8" mirror to about 1/6th wave in the basement (in the Griffith Observatory, LA), but several folks were egging me on to improve it more. I would carefully hot press the mirror, do a few figuring strokes, and then test. Darn! Too far. Hot press again, then do a few corrective strokes. Now I'm really screwed up! This went on for a few weeks with no improvement. Then a fellow named Tom Cave (Cave Optical in Long Beach) came over to me and suggested that I might want to come to his shop. He volunteered to put me in his temperature controlled workshop and show me exactly what I was doing wrong. Although the guy worked in Long Beach, I talked my dad into driving me down there on a Saturday morning. The shop was full of beautiful scopes, including a 16" Cassgrain that had just been completed. In less than an hour the guy had demonstrated what I was doing wrong, then turned the mirror over to me. Another 15 minutes passed while, under his scrutiny, I carefully applied the last few strokes. A short clean-up and mirror cool-down, and it was placed on the test stand. The Ronchi showed very close to a 1/10th wave mirror, supported by zone testing! I was elated!*

As I was leaving, Tom asked me how I planned to mount the optical tube. I told him I hoped to build a pipe mount but couldn't manage making the Babbitt bearings. He mentioned that he had a used mount that he didn't need any more and would part with it for $50. I asked if he would hold it for me until I could collect enough bottles (at $0.2 per bottle refund) to buy it. He agreed. As I carried my mirror out to our car, Tom carried out a mount wrapped up in plastic, and told me to take it with me. The only condition was that I was not to sell it in the future. I agreed. When arriving home I unwrapped the (what I thought was used) mount, only to find a brand new German equatorial mount with a R/A clock drive. I called him and promised to pay for it, but Tom wouldn't hear of it.

I still have that mount, with the original paint, a little worse for wear with a loose Dec bearing, but the drive still works. I'll leave it to my son when I'm gone, along with the story of a guy who saw something in me that he wanted to



encourage. Every time I observe Mars I think of Tom Cave." Forrest.

I especially like this story since Forrest is carrying on the same tradition Tom Cave started with him, by sharing the universe with so many! The Cameron Park Observatory is just a new instrument enabling him to share the skies with even more folks!

After enjoying the orientation meeting, we all gathered in the observatory under a quarter Moon soaked stellar landscape. After all we weren't there to find dim fuzzies, but to experience the observatory itself. I fully expected to find two 14" Celestron telescopes, and was pleasantly surprised to see a brand new 17" Dall Kirkhman from Plane Wave telescopes! Forrest was holding out on us! What a beautiful scope with a carbon fiber lower end, and a truss assembly supporting the spherical secondary mirror and machined aluminum spider assembly. I especially like the lightweight truss design because it breathes and equalizes temperature so well. The Dall Kirkhman primary is ground elliptical, on the other side of the parabola from a Hyperbolic Richey Chretien. The secondary has a convex spherical curve, which makes collimation much easer. There isn't just one collimation position, because any position works on the spherical surface. It employs a corrector lens just ahead of the focuser, to flatten and correct the field. Both scopes are on massive Astro Physics equatorial go to mounts, with isolated piers, giving the telescopes a no nonsense professional aura.

Jupiter was within a degree of the Moon, and the view in the 17" was breathtaking. The great red spot was prominent at lower center. The Moonscape was sharply detailed and relieved as only a large aperture can capture. Orion was a short jaunt from the Moon, and the Orion Nebula showed the four central stars as if they were suspended in three dimension. Forrest looked right at home running the Plane Wave, notice the terrific mural behind him on the back wall. The other 14" Celestron has a full color Mallincam video camera attached, displaying it's objects on a monitor in the corner. Very convenient for large crowds. I also need to mention they have a 90mm Coronado solar filter that attaches to the 4" TeleVue guide refractors objective on the Celestron. The Coronado rear blocking filter is in the diagonal, and using the tracking capabilities of the Celestron is a great solar observing aid. There are three rules for observing the sun: 1st, don't look directly at the sun, 2nd– don't look directly at the sun, and 3rd– don't look directly at the sun!

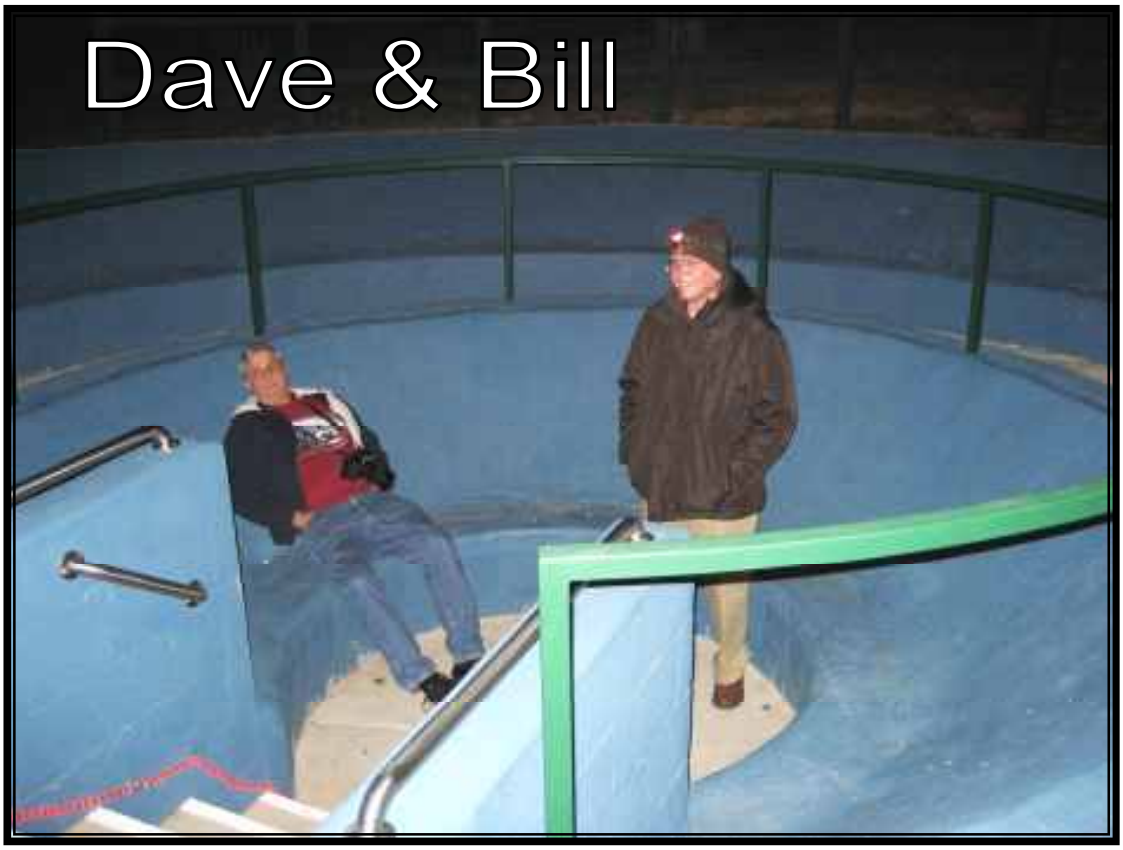
The doughnuts came with a guarantee not to transfer any sticky stuff to the eyepieces.

We spent a hour or so observing, eventually gathering back in the main entry room. I brought doughnuts and drinks, which came with a guarantee not to transfer sticky stuff to the optics, and we finished them off to the very last one.

If you would like to visit The Cameron Park Rotary Observatory, it's open Fri, Sat, and Sunday evenings, to the public. They would be happy to open during the week for special occasions. Check out their great web site for

further info. **http://www.communityobservatory.com/**

Saying goodnight to a very memorable evening, left us with a desire to return again soon. It also left me with some great ideas to make our own HGO observatory even better! We miss Forrest at SVAS, and it was great to see him again. He still supports the SVAS 100%.



Astro AP Photography

by Wayne Lord

Chapter 3 Types of Cameras

We now come to one of the most important subjects in taking astronomical photos – with what to capture the images? And the question to ask yourselves in this regard is, "What am I going to image?"

Note: The photos in this article are of cameras I own, and are intended to be only representative of the type of cameras in that class.

Webcams

Webcams can work well to image planets. Here you want a large number of images to sort and stack to work around atmospheric distortion. Many people create AVI streams using a webcam. The resulting movie is processed, frame-by-frame, by software that weeds out blurred or foggy images, stacking only the best for the final image. In selecting a webcam, you need to evaluate its resolution, since this determines how well you can image fine details. One other problem is how you will interface it with your telescope. You will mostly be doing eyepiece projection, and the lens of the webcam has to fit closely and firmly to the eyepiece of your telescope. In order to do this you may have to take apart the webcam, so it will probably have to be a dedicated camera for AP.

Another drawback to webcams is their sensitivity. Since they are not designed for low-light situations they will probably not be suitable for use on deep-space objects. If you are planning on exclusively working on the moon and bright planets, this type of camera will likely work OK for you.

PROs – Inexpensive, can capture many images in a short time, or stream video.

CONs – Not good for low light use, difficult to attach to telescope eyepiece.

USAGE: Primarily lunar and planetary.

DSLRs

Skipping over point-and-shoot cameras, which in general do not work well for AP, the next type is the DSLR, or digital single lens reflex with removable lenses. DSLR cameras work best for wide-field imaging, although they are not limited to that by any means. You can piggyback a DSLR on your telescope and use whatever camera lenses you have for this purpose. By far the majority of people using DSLRs for imaging

prefer the Canon brand cameras. I am not sure of the reason for this. Canon did produce a couple of cameras several years ago that were designed for use by astronomers, but I don't think this marketing would affect the great number of imagers. Nikon cameras can be used, and are probably the next most popular choice. Regardless of the camera, if you are using it with a telescope you will need some way of attaching it. This is done with a T-adapter. These devices are specific to each camera or type of camera. One side fits into the place where a lens normally would go, and the other side has standard threads to fit other devices such as nose pieces, extenders, Barlows, and other adapters as well as screwing directly onto the visual back of Cassegrain and Maksutov-Cassegrain type telescopes or onto the threads of a focuser. While high-end DSLRs have a lot of available settings, in most instances you will be using the Manual mode with the maximum exposure time, usually 30 seconds, or using a cable shutter release and Bulb mode for longer exposures. The cable release is going to be a necessity in any case to help prevent jiggling the camera when you want to make an exposure. Another good feature to look for is mirror lockup ability. DSLRs make use of an angled mirror to reflect the image to an eyepiece. During normal imaging this mirror quickly retracts up to allow light onto the sensor for an exposure, then slaps back down. This can create vibrations when you first start an exposure, so locking it up before starting an exposure eliminates this vibration. Something else to consider in selecting a DSLR is that they all have infrared (IR) filters. This is fine for terrestrial photography since infrared rays focus differently than visible light, but if you want to get the nice red color of the Rosette nebula you will want to have this filter removed, or alternatively take much longer exposures with an un-modified camera. Removing the IR filter should be done by an experienced person; a quick online search will display several places where the camera can be sent for modification. (http://www.hapg.org/camera%20mods.htm) ; or if you are brave and skilled, you can try it yourself (http://www.lifepixel.com/tutorials/infrared-diy-tutorials/canon-rebel-xt-350d) Of course, this voids any manufacturer's warranty, and may make the camera unusable for normal terrestrial use.

DSLRs use CMOS (Complementary Metal Oxide Semiconductor) technology sensors, which are great for terrestrial use but less than optimum for AP use, although that may be partially offset by their greater resolution and image size. You can get either APS-C or full-frame DSLR cameras for a fraction of the cost of the equivalent sized CCD (Charge Coupled Device) cameras. Another difficulty in using DSLRs is the long exposure times needed for most deep-space work. Many of the DSLRs are limited to 30 second exposures without the use of special equipment or software. While 30 seconds may seem like a long exposure for terrestrial work it is rather short for astronomy purposes. In going with longer exposures, however, heat becomes a problem. All sensors generate heat as the current flows through them, and the longer it flows the more heat builds up and causes "amp glow" in the resulting image. Very few DSLRs are equipped with cooling for their sensors while most of the better CCD cameras have cooled chips. Some people have developed ways of getting around this for their DSLRs, such as insulated boxes fitted to the camera, pre-cooling the camera in a refrigerator before an imaging session, or just shooting in colder weather when the ambient temperature is low. Make sure to keep your batteries warm, though, since they lose capacity rapidly when cold. And that brings up another issue. Most DSLR cameras are battery operated, and holding the mirror and shutter open for long exposures takes a lot of energy, so for a long imaging session you will want either several fully charged batteries or an external power source and battery adapter. Another factor is weight. Most DSLR bodies weigh several pounds and may stress focusers and cause balance problems when used on reflector telescopes. This is not as much of an issue for refractor or catadioptric (Cassegrain, Maksutov-Cassegrain) telescopes, but is still a consideration.

PROs – Readily available, relatively inexpensive for large imaging chip when compared to CCD cameras.

CONs – Weight and size, lower sensitivity compared to CCD, heat buildup, IR filter unless modified, battery power needed.

USAGE: All applications although primarily better for straight-through systems (non-refractor).

CCD Cameras

Since there are many different types of CCD cameras covering a broad price range, I am going to break this category down a bit further:

Guide cameras and planetary imagers – In some cases these two cameras cross over and can be used interchangeably. Guide cameras are used along with a short focal length guide scope, similar to a finder scope, and provide signals to keep the mount pointed at a selected star, using a program such as Stark Labs PHD (Push Here Dummy). When set and operating correctly, they can allow much longer exposures, without trailing, than an unguided mount. Planetary imagers are designed for imaging bright objects, such as the moon and planets, and are generally less sensitive and with smaller chips than other types. These cameras are not normally equipped with cooling chips. Cameras in this category: Orion StarShoot Autoguider, $279.99; Orion StarShoot 3MP Planetary Imager and Autoguider, $349.99. A note on the parfocal ring shown in the image above. There is no focuser for the 50mm guide scope I use, so in order for this camera to reach focus the nosepiece must be backed out a short distance. The parfocal ring provides this extra spacing.


Orion Starshoot AutoGuider Camera
w/ Parfocal Ring, nosepiece, and dust cover

Orion StarShoot AutoGuider Camera
Back view with connections for guide cable to mount and USB connection to computer.

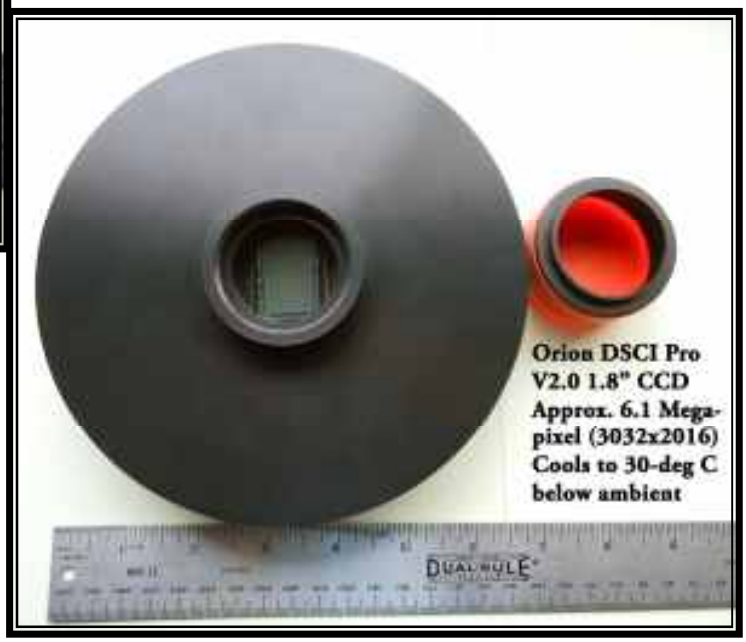
Deep Space Imagers, Color and Monochrome – Here we come to another decision point: do you want to do One-Shot Color (OSC) imaging or Monochrome imaging with filters. OSC cameras take one image to capture color. To do this the imaging chip has a Bayer mask over it that splits up the colors into Red, Green and Blue in a Bayer Matrix, usually with two green filters so it is something like..

R G
G B

This means that only ¼ of the sensors get a particular color so your 12 megabyte sensor is effectively only 3 megabyte. It isn't quite that bad, but you get the idea. The advantage to OSC is that you only need a single image to get color, although in fact you will be taking multiple images of any one dim subject and stacking them. More on this in the processing chapter. The image will then be "DeBayered" in the processing software to recreate the color. Monochrome imagers, on the other hand, use Red, Green and Blue filters, plus one without filtering (Luminance). The full chip captures one color, then the filter is changed to the next color, etc. until you have exposed four images of the same object. The optical train (from the objective lens through to the camera) cannot move during this time or your images will be offset, although the individual color images don't need to be as long as in OSC imaging since the entire chip is being used. The LRGB images are processed in software to recombine them into a color image. So, to summarize OSC versus Monochrome, OSC only requires one exposure to monochrome's 3 or 4 images, so is simpler. Also, no external filter wheel is needed, so that saves some extra equipment. OSC imaging is also less susceptible to tracking or mount movement since only one image is needed for a particular subject versus three or four for the monochrome. So, why would anyone use monochrome? Better resolution and better control in color processing. Both types have cooling

chips and fans, needed to help eliminate hot pixels and other noise from high temperatures.

Some more examples from Orion's selection of cameras: StarShoot G3 Deep Space Color Imaging Camera (~.5 Mpx), $399.99; same camera in Mono-chrome, $399.99 (but you will need filters); StarShoot Mono imaging Camera III and 5 filter wheel (1.5 Mpx), $999.99; StarShoot Pro V2.0 Deep Space Color CCD Imaging Camera (6.1 Mpx), $1199.99; Parsec 8300C Color Astronomical Imaging Camera (8.5 Mpx, no longer available from Orion).



Above, my original StarShoot Deep Space Color Imaging camera, purchased in 2006 for $400 and supplanted by the G3 camera for the same price. This camera came with a cooling chip, which eventually stopped functioning, prompting the purchase of the newer, bigger StarShoot DSCI Pro V2.0, shown at right.

As you can see from the ruler below the pictures, this camera is quite a bit larger than the original and has better cooling with a much larger imaging chip.

There are other cameras available from other manufacturers such as QSI, SBIG, and Mallincam. These tend to be much more expensive, but if you have the money they would be worth investigating. You also need to watch how much weight you are hanging off your focuser, as some of these cameras can get pretty hefty.

A little comparison here. The first image, at left, is one taken several years ago with the original DSCI camera, and is pretty much full resolution (752x582 pixels). It is a composite stack of 20 two-minute images.

Next is a recent image of the same area with the new camera. It has to be reduced to fit on the page since its resolution is 3032x2016 pixels or 30.4” by 23.2” at 72 pixels per inch.

This image was taken with the StarShoot Pro v2.0 camera in an 8-inch f/4 Astrograph from my Citrus Heights back yard on January 31, 2013. It is a stack of 5 two-minute images. It still has some problems though. It exhibits coma error close to the outer edges, as well as vignetting due to using a 1.25” nosepiece and adapter in front of the sensor. When time permits, I plan to re-take this image with a coma corrector in place and the full 2-inch opening.

The next chapter will cover methods and software to process your images once you get them.

See you next time!

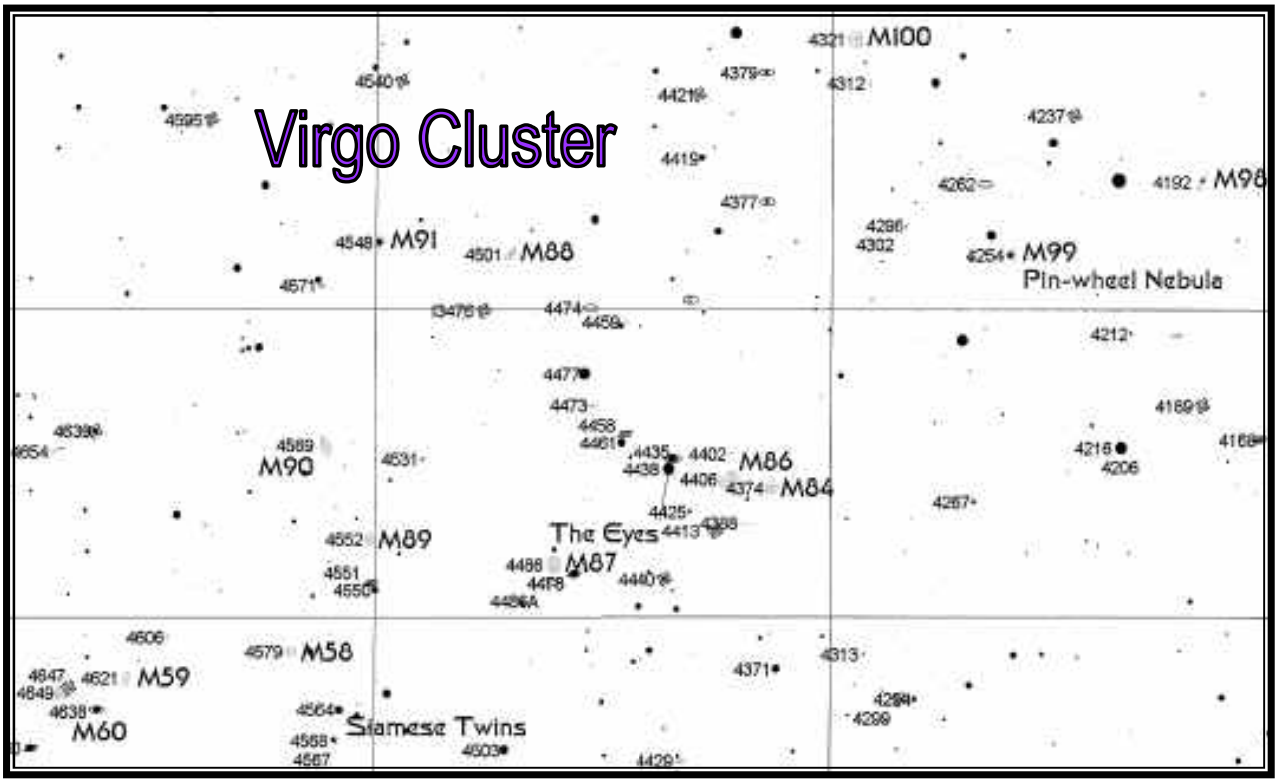
Observing Guide for March & April 2013

by Davin Enigl

This column is devoted to looking at the night sky on the darkest night of the month. March is traditionally the Messier Marathon month -- finding all 110 (actually 109) objects on the Messier list during one single night. It's a competition with rules for the size of telescope and the type of aides that are used to find the objects. One rule above all is that computers and digital setting circles can not be used. This means guide books and visual clues such as star hopping is legal. You can use guides such as the Kepple and Sanner's *Night Sky Observer's Guide* (NSOG), the *Uranometria* (both available in SVAS's Henry Grieb Observatory), and Stephen James O'Meara's (1998) *Deep Sky Companion: The Messier Objects*. A planisphere (rotating circular sky chart) is also helpful to find the Messier objects by time and day of the month.

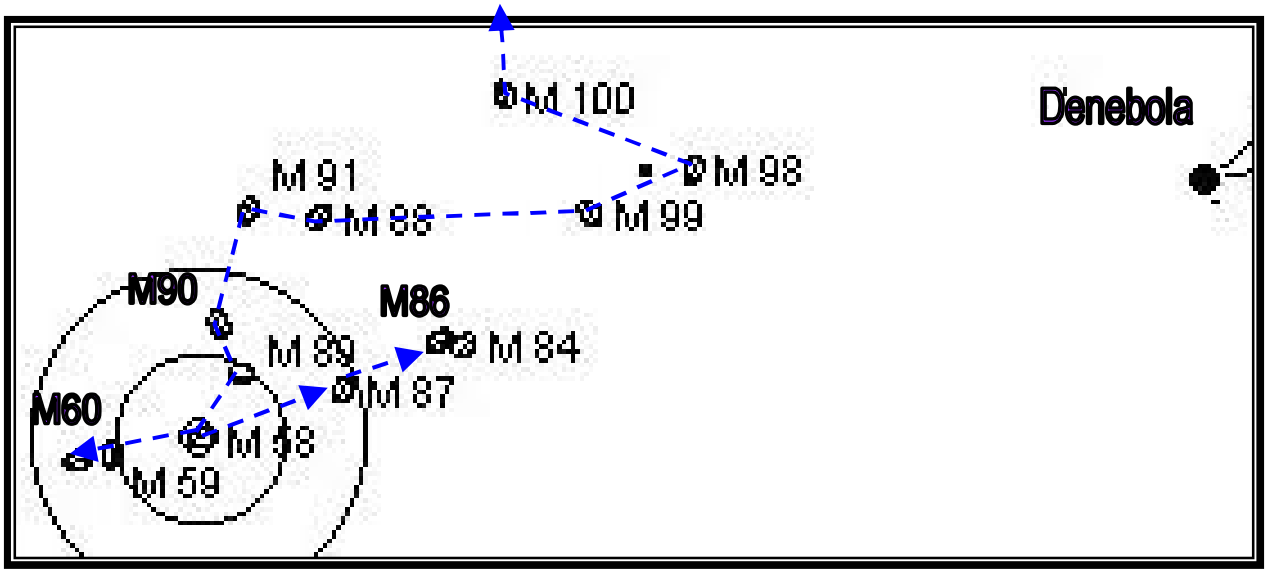
> Both the sun and the Moon must be in an area without Messier Objects for a full 109 marathon!

The SVAS may sponsor a Messier Marathon with Tim Tingey as volunteer coordinator. It will probably take place next year because there should be training before the actual competition. In 2013 the best chance for a Messier Marathon training session is on the darkest night in March, which starts on Saturday the 9th. Both the sun and the moon must be in an area without Messier objects for a full 109 marathon to be successful. Interestingly, one of our most famous Northern California astronomers (and SVAS supporter), Don Machholz started the first west coast marathon in September 1978. For a better look into marathons, get his book: *Messier Marathon Observer's Guide: Handbook and Atlas*.



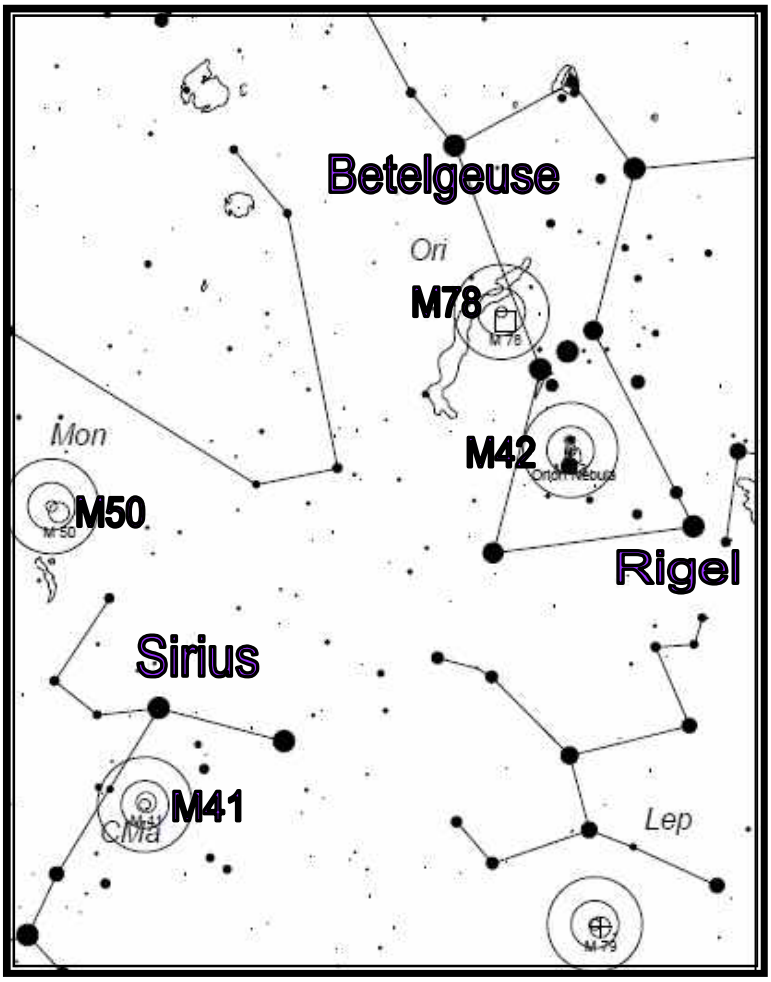
To many experienced astronomers, the Messiers are less interesting, and they have moved on to Caldwell objects, NGCs, ICs or even rarer un-

classified objects. The Messier objects are seen "too close together and are therefore "too difficult" to identify. Also, many experienced astronomers feel competition puts a lot of pressure on people, with a very real possibility of failure and frustration in the hobby.



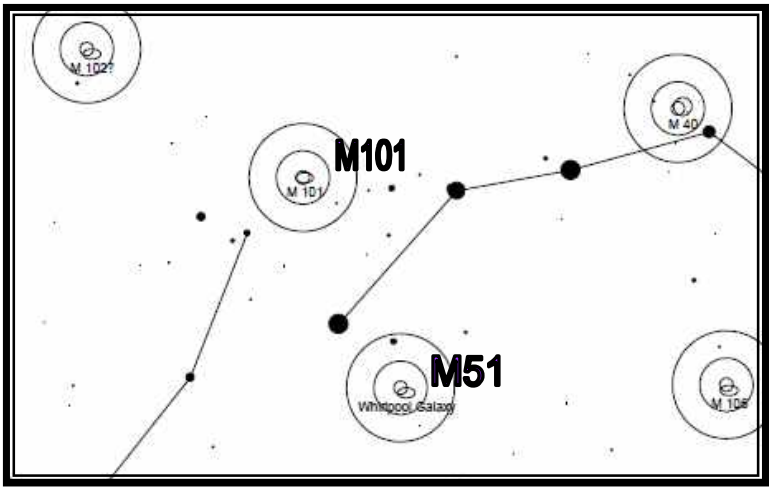
When navigating the congested part of the Coma-Virgo Cluster, it's best to use M58 as a pivot point. Pick up M59 and 60 to the east of M58 first, go back to M58, then northwest to M87, 84 and 86. Then back to M58 and north to M89, 90, 91 and from M91 west to M88. Directly west of M88 is M99, and northwest of that is M98. east-northeast of M98 is M100 and finally north of that is M85.

Other than a marathon, Messier objects are good guides for testing equipment: telescope alignment, focus, collimation, and resolution. They are also good to test sky conditions for seeing and transparency. Always test with Messiers before moving on to more difficult objects. If you can't see the targeted Messiers, then you know you can't see deeper, dimmer -- more difficult objects. Therefore all astronomers should get to know some Messiers to test and fine tune their equipment as well as check the sky conditions.



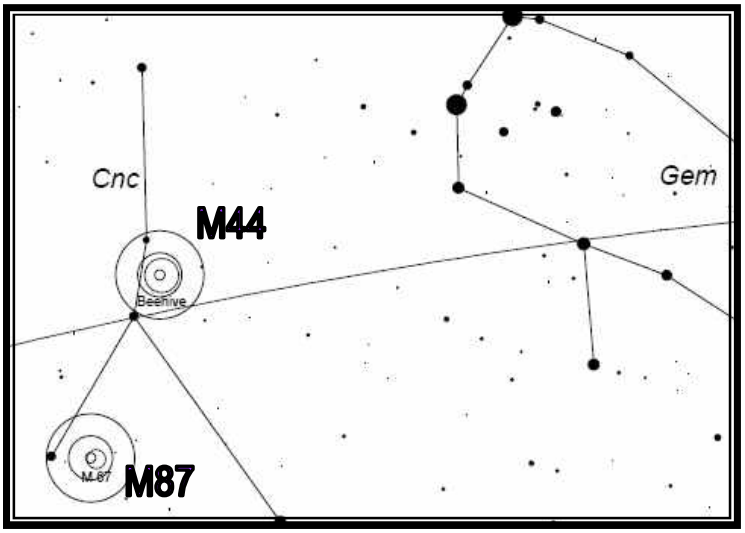
In March, the winter constellations are still prominent early in the night. In particular, Orion is visible in the West. Therefore to test the sky and equipment, Messier M42 should be used before it sets. So take a look as soon as possible after sunset. Most people know this as the Great Nebula in Orion and have seen its cloudiness many times. First, can you see it visually, naked-eye? If not, it's not very good for observing yet. If you can see it, then you know the observing is already good. Second, to the lower left is the brightest star seen from Earth, Sirius, Alpha Canis Major. Does it look as "cloudy" as M42? If so, the sky has too much moisture for good observing. It should look much sharper and pinpoint compared to M42. Third, is M42 or Sirius shimmering, waving or sparkling? If so the sky has too much wind for good observing.

Two more Messier tests, through a telescope, are for measuring darkness. Both are at the end of the Big Dipper's handle. M101 is a face-on galaxy. It has a very low surface brightness, meaning the stars are sparsely spaced, thinned out so to speak. Therefore unless there are good sky conditions and darkness, you can't see M101 espe-

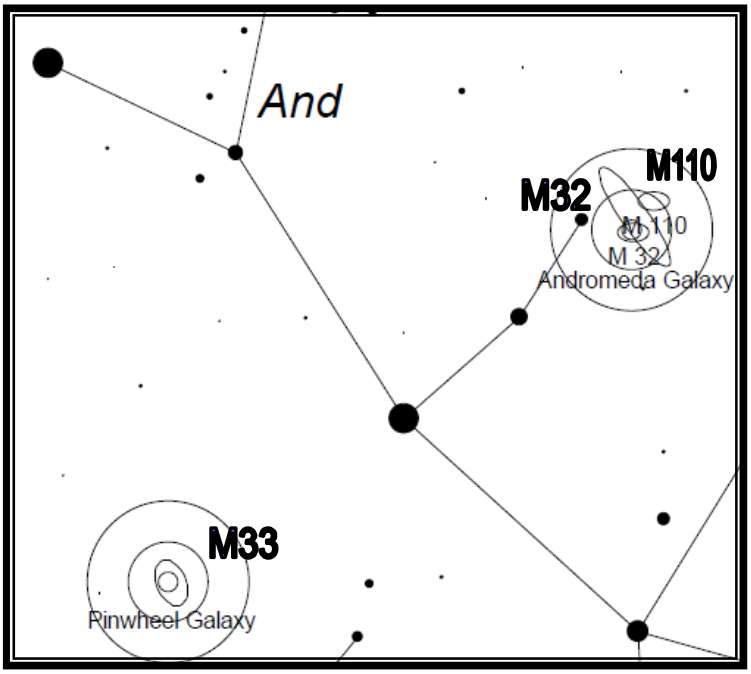


cially it's spiral arms. The other test uses M51, the Whirlpool galaxy (actually two colliding) because it is also face-on. It is easier to see because the stars are denser than M101. M51 gives a measurement of acceptable darkness if you can see the spiral arms and both parts of the colliding galaxies (NGC5195 is the smaller galaxy). If you can't see M51 and M101, then the sky is not dark enough.

Next, look naked-eye, to the right (West) of Orion past Jupiter. Here is M45, the Pleiades. Look for nebulosity and stability of the stars. If the stars are rock solid and there is cloudiness, the sky is in good condition. Similar to M45 is M44, the Praesepe (Beehive Cluster) located about half way between Orion and Leo. The stars should look clear and stellar to the naked-eye - no nebulosity.



The Andromeda Galaxy group (M31, M32 and M110) is very low in the west to see naked-eye, but this is the best and only time to see it during a Messier Marathon this month. (By the way, M52 and M39 are usually the last objects in a Marathon just before dawn.) So, a telescope is needed as soon as the sun has set. If Andromeda was higher, M31 should be easily seen naked-eye if sky conditions are good. This is also a test of how dark-adapted your eyes have become. If M31 is high, you should see it naked-eye -- if your eyes have correctly dark-adapted.



If M31 was easy, then you will want to test the sky for even better seeing. Try looking for M33, South of M31. M33 is a face-on but can be seen naked-eye if the sky conditions are good.

So starting with M31 at about 0:30 hours RA as early as possible after sunset and going to M52 and M39 at about 23:30 hours RA as long as possible before sunrise -- all 109 objects are theoretically visible sunset to sunrise.

Since so much has been written about the Messiers, I will now review those other objects near to them.

If you are marathoning, you will not have much time to notice other interesting objects near to the Messiers. Since so much has been written about the Messiers, I will now review those other objects near to them.

M4 - Antares, the large red supergiant star in Scorpius. This star is easy to find in the Summer and if you can see M4 next to it, that means the sky is getting dark enough to see much deeper into space. M4 and Antares should always be used to test sky conditions and darkness before trying to go deeper in Summer

or whenever they are visible. In March you will see them too towards dawn, about 5 a.m.

M13 - NGC6207 is a neglected galaxy just north northeast of M13. It's another good test of the sky conditions at 11th magnitude and brighter.

M14 - You will need a star map, but Barnard's Star is north east of M14.

M35 - NGC2158 is six times more distant than M35 but can be seen in the same field of view.

M38 - NGC1907 is a cluster right next to M38.

M41 - Sirius is to M41's north.

M42 - The Trapezium is a cluster of stars embedded inside M42. Usually four stars (ABCD) are seen. You can use this to test sky conditions if you see more than four stars (ABCDEF), you know it's a good night.

M52 - NGC7635 is the Bubble Nebula H-II ionized gas. It looks like a planetary nebula and is classified as such, but it really is just ionized gas, not an exploding star.

M57 - OK, this one is difficult: IC1296 is a face-on galaxy right next to M57. It's a "fog" circle inside a little star-stick house - like kids draw. If you see this, you know you are doing a really good job at seeing deep objects and the sky conditions are good.

M64 and M65 - NGC3628 is near.

M70 - IC4776 is a "fuzzy star" planetary nebula south-southeast of M70.

M72 and M72 - To the northwest of these two is NGC7009 is the Saturn Nebula. Messier missed this one.

M77 - The galaxy itself is colored blue. It's a "Seyfert Galaxy" with a high energy "exploding" active nucleus. I included M77 on this list because its details are often overlooked.

M81 and M82 - Look for NGC 2976, 3077 galaxies.

M84 and M86 - Markarian's Chain. Ten galaxies are in view within one degree. You will need a detailed star map to identify them all: NGC 4438, 4435, 4402, 4387, 4388, 4413, etc. Look in *Uramometria* 2nd edition, chart 91 and A13. Bobroff's *Astroatlas* has this area on it's cover and chart D33.

M101 - There are many galaxies near M101 probably contributing to confusion. M102 was "lost", giving Messier's list 109, not the 110 listed. Try to see NGC 5474.

M104 - Asterisms: "The Shark" and "Stargate" point to the Sombrero Galaxy.

M105 - NGC3384 and 3389 galaxies are near.

M106 - Look for NGC4217 galaxy to the southwest.

Tackling the Really BIG Questions

by Diane K. Fisher

How does NASA get its ideas for new astronomy and astrophysics missions? It starts with a Decadal Survey by the National Research Council, sponsored by NASA, the National Science Foundation, and the Department of Energy. The last one, *New Worlds, New Horizons in Astronomy and Astrophysics* was completed in 2010. It defines the highest-priority research activities in the next decade for astronomy and astrophysics that will "set the nation firmly on the path to answering profound questions about the cosmos." It defines space- and ground-based research activities in the large, midsize, and small budget categories.

The recommended activities are meant to advance three science objectives:

1. Deepening understanding of how the first stars, galaxies, and black holes formed,
2. Locating the closest habitable Earth-like planets beyond the solar system for detailed study, and
3. Using astronomical measurements to unravel the mysteries of gravity and probe fundamental physics.

For the 2012-2021 period, the highest-priority large mission recommended is the Wide-field Infrared Survey Telescope (WFIRST). It would orbit the second Lagrange point and perform wide-field imaging and slitless spectroscopic surveys of the near-infrared sky for the community. It would settle essential questions in both exoplanet and dark energy research and would advance topics ranging from galaxy evolution to the study of objects within the galaxy and within the solar system.

Naturally, NASA's strategic response to the recommendations in the decadal survey must take budget constraints and uncertainties into account.

The goal is to begin building this mission in 2017, after the launch of the James Webb Space Telescope. But this timeframe is not assured. Alternatively, a different, less ambitious mission that also address the Decadal Survey science objectives for WFIRST would remain a high priority.

The Astrophysics Division is also doing studies of moderate-sized missions, including: gravitational wave mission concepts that would advance some or all of the science objectives of the Laser Interferometer Space Antenna (LISA), but at lower cost; X-ray mission concepts to advance the science objectives of the International X-ray Observatory (IXO), but at lower cost; and mission concept studies of probe-class missions to advance the science of a planet characterization and imaging mission.

For a summary of NASA's plans for seeking answers to the big astrophysics questions and to read the complete Astrophysics Implementation Plan (dated December 2012), see http://science.nasa.gov/astrophysics/. For kids, find lots of astrophysics fun facts and games on The Space Place, http://spaceplace.nasa.gov/menu/space/.

Space Place Partners' Article February 2013 This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Clusters of galaxies collide in this composite image of "Pandora's Cluster." Data (in red) from NASA's Chandra X-ray Observatory show gas with temperatures of millions of degrees. Blue maps the total mass concentration (mostly dark matter) based on data from the Hubble Space Telescope (HST), the European Southern Observatory's Very Large Telescope (VLT), and the Japanese Subaru telescope. Optical data from HST and VLT also show the constituent galaxies of the clusters. Such images begin to reveal the relationship between concentration of dark matter and the overall structure of the universe.

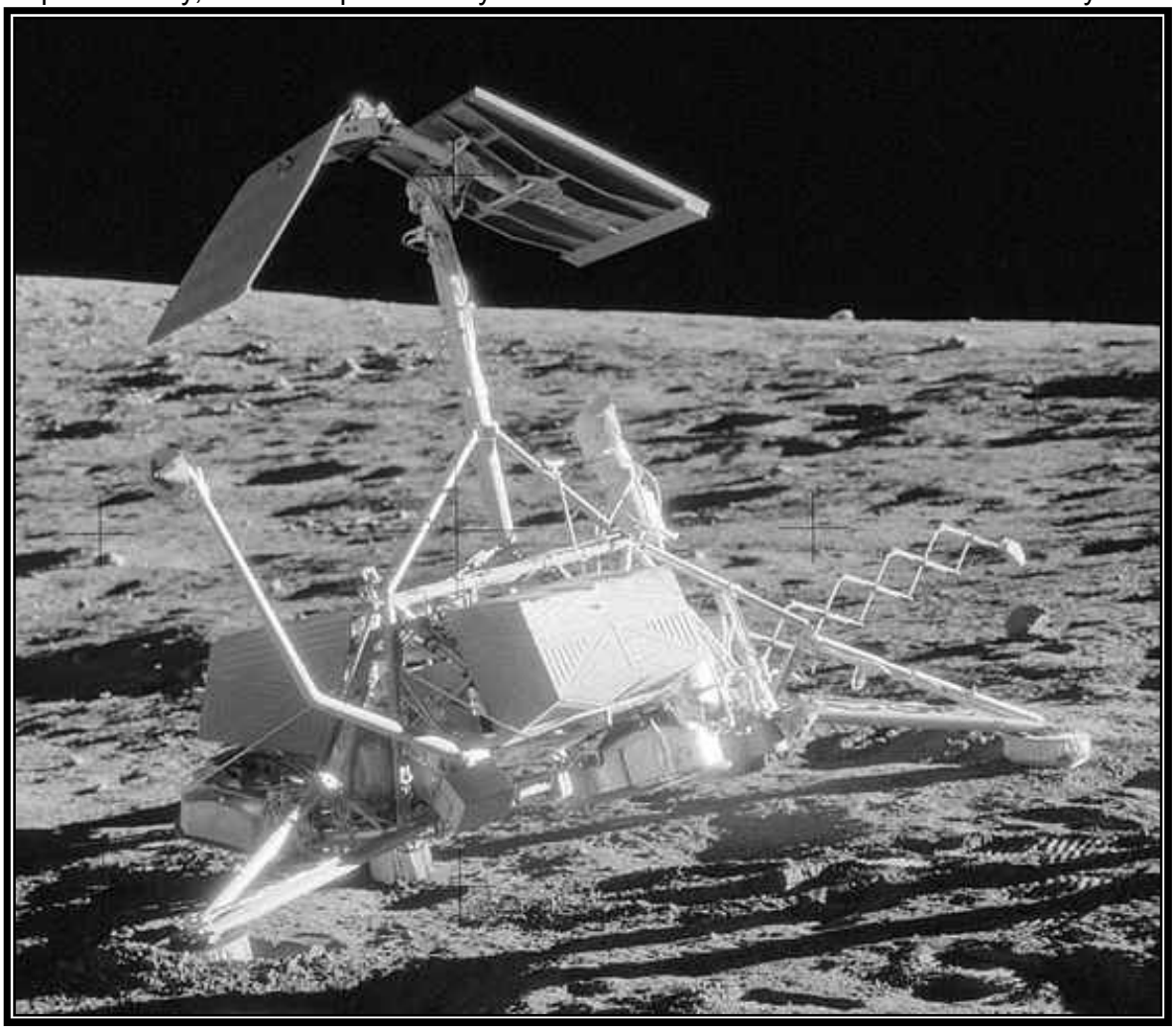
A JOURNEY INTO SPACE- HITCH HIKER STYLE?

by John Jaksich

Often times many of us wonder if we will find life beyond the confines of our planet? The Earth teems with many types of life—in the oddest places it may seem at times. The latest finding is from Lake Whillans under the Antarctic ice—other odd findings for life come in the form of nematodes. Tiny and microscopic—it has been estimated that there are so many species of nematode that no corner of the Earth is not occupied by one species or another. Bacteria are more numerous on the Earth than any other species of life—as well. And of course—it had been joked that prior to the 1967 U.N. Outer Space Treaty, that lunar probes may have contaminated the Moon's surface. Surely enough, terrestrial bacteria were found by the Apollo 12 astronauts on NASA's Surveyor 3 probe of the 1960s.

Researchers have determined that the heartiest of bacteria survive simulated conditions on journeys to Mars (as well as survival upon the Martian surface).

Shockingly enough, of late, researchers have determined that the heartiest of bacteria survive simulated conditions on journeys to Mars (as well as survival upon the Martian surface). This evidence calls into question whether we have already contaminated Mars in 1976—the year which the twin Viking spacecraft landed upon the surface of the red planet. Although at the time—results of “life detection” experiments came back as questionable or non-existent. Some planetary scientists cast a skeptical eye upon the results. And, needless to say, the mass spectral data from the Viking landers do indicate the possible presence of methane.



Photograph of Surveyor 3
Allan Bean Apollo 12
Source: NASA via Wikipedia

A recent publication (Stieglmeier, etal, 2012) indicated bacteria can survive the sterile conditions of ESA

spacecraft-associated clean rooms. The published results revealed three types of non-spore forming bacteria survived—namely, Staphylococcus, Micrococcus, and Acinetobacter. Standard clean room hygiene of 80 degree Celsius "Heat-shock" failed to remove these bacteria. It is unknown to scientists why this may occur—currently. It should also be noted that certain strains of bacterial spores survived as well, and the mention of non-spore forming bacteria imply the extent and diversity to which the clean rooms need to be reassessed for sterility .

Directly from the study:

" ' . . . results presented here clearly show that standard protocols required by the space agencies underestimate the abundance of microorganisms in clean room facilities. For more accurate estimations of the actual bioburden, additional analyses and improvement of current methods are necessary. . . .' "

However, there is more to the study—as well. The methodologies required to assure complete sterility (at the current juncture) entail devising better detection methodologies of contaminants.

Directly from the study:

" ' . . . the introduction of a bead-beating step in the DNA extraction procedure could help assess the bacterial spore DNA for molecular analyses. Further, the application of propidium monoazide staining techniques could help distinguish 16S rRNA gene signals from intact (viable) or dead cells. . . ' "

The references in the paper are a wealth of information for those who may be interested in the current state of clean room hygiene.

In closing I "further" quote from the study:

" ' . . . The analyses of European spacecraft assembly facilities and in particular the consequent comparison of current standard assays with molecular microbiology techniques have significantly improved our understanding with regard to community structure, concentration, distribution, and bioburden in spacecraft assembly facilities. . . ' "

In my closing—it may further be argued that these "bugs" may shed some light as to why certain bacteria "morph" into super-bugs, but that is a question for another time and place.

REFERENCES:

Stieglmeier, etal, (2012) Astrobiology, Vol 12, Number 6.

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