And Away We Go!

Welcome to the summer, AAS members! School is out; the kids are on their Xboxes; and the skies dump rain on us again. So far, the late spring and early summer are looking like a repeat of last year. I hope it’ll clear up soon so we can get in some great planetary viewing.

Our EEO Work Day was rained out, but Equipment Chair, Domingo Rochin, has things well under control. We’ll get our repairs done in smaller chunks over the course of the summer. You’ll notice that the rock for upgrading our path to the observatory has been delivered, and you’ll notice we have a larger handicapped portable restroom back on the property. I’ve also been in contact with Cindy Bower at Calibre (Canyon of the Eagles), and we’ll be getting some repairs done to the EEO structure as the summer progresses.

At the AAS Executive Committee mini-retreat on June 5th, we heard a number of great ideas, and we saw some impressive plans for engaging and educating our membership in the year ahead. We are planning for a longer board retreat on June 25th.

Monday’s meeting (June 6) was the official first business meeting with your new board members. (Please thank the outgoing members for their service, and welcome and support the new board members in their efforts.) At the meeting, we agreed to review a plan from Domingo to remove and store the Ealing scope. Increasingly, the Ealing has been difficult to maintain, and its reliability has been a challenge for the Canyon of the Eagles staff. Canyon of the Eagles and AAS both have scopes and mounts that could be used to replace the Ealing, and those scopes may be easier for Canyon of the Eagles staff and AAS members to operate. Easier operation also will make it easier for us to staff our events with our stable of trained observatory operators. Stand by for more information as these plans are received by the board and reviewed in the next month.

We also agreed to join Astronomers Without Borders, Greater Austin STEM Ecosystem, NASA’s Texas Space Grant Consortium, and Mission Capital to expand our network of allied organizations and to further our access to their
(President’s Corner continued from page 1)

resources.

A big AAS “thank you” goes out to a few of our donors. Member Nathan Morgan’s business, Partspeople.com, donated a Dell projector to AAS. Member Ken Moseley donated a Sirius 2.3-meter personal dome observatory and a La Sueur Aurora Astro Pier. Member Mike Slack donated a 10” Meade LX200 SCT. We are appreciative of their contributions, and we look forward to finding ways to put them to good use soon!

We are now in the run-up period to our annual Austin Under the Stars event on July 23rd. A number of us had been looking for an opportunity to engage our newer and less-experienced members with a scope clinic. My thanks go out to this year’s Member Services Chair, Joi Chevalier, for having the idea to combine it with our July members-only star party. “Out of the Box” is aimed at members who may have scopes they may be unfamiliar with or need some help putting them to use. This should be a great family-friendly event, and we hope you will join us or volunteer to help out. Please see our website for more details about this event.

For AUTS itself, start dusting off your scopes and get ready for a really big show. We expect a higher attendance this year, and we’d like to have more speakers during the afternoon. Former Nominating Committee Member Marcha Fox has offered to speak on the importance of scientific accuracy in science fiction writing. We’d love to have a few more AAS members present on topics of interest as well. Please let us know if you are willing to assist.

And my thanks go out to Dawn Davies, who has agreed to continue with the planning for AUTS as “interim” Outreach Chair. While there are a number of folks who have expressed interest in assisting with outreach, we have yet to identify candidates to fill the role of Outreach Chair. Likewise, we are still missing a Communications Chair and a Parliamentarian. Please let us know if you are interested in serving.

Finally, I’d like to offer a welcome and thank you to our new members. I see our (unofficial) count as of today is 620 members (482 memberships). Please, when you come to our meetings or events, take a moment to introduce yourself to one of our board members. We really would like to have the chance to meet you and find out what attracted you to AAS and what caused you to renew your membership. If there’s a topic that is dear to your heart, or you have a special skill you’d like to bring to our attention, please let us know. A number of our newest members are already on our board and making wonderful contributions. I bet you’ve got some great insights as well.

Here’s hoping for clearer skies ahead!

My best always,

David Mathias
President
COME TO THE JUNE MEETINGS

When: Friday, June 10, 7:30 PM (PA 6:30 PM)
Where: RLM 4.102 - UT Campus
Dean Keeton and Speedway SE corner--
Across Dean Keeton from our usual location

General Assembly
Keely Finkelstein, PhD, is Research Associate and Lecturer in UT Austin's Department of Astronomy, and also leads the Outreach efforts at MacDonald Observatory. She'll join us to discuss the Observatory’s outreach efforts and education programs.

Practical Astronomy
Jim Spigelmire and Mike Kryzwonski lead us through the second installment of their Astronomy basics series, Astronomy 102 - eyepieces, collimation, how to find stuff in the sky and more. Check AAS website for details.

OUT OF THE BOX

Have you bought a telescope, but not yet taken it out for a spin? Or had even more questions once you did open it?

Never fear - on July 9th, your fellow AAS members will host Out of The Box, a clinic specifically for you! Bring your new or unused telescope out to our AAS dark sky site, Eagle Eye Observatory at Canyon of the Eagles on Members’ Night, and get your new telescope questions answered. In the late afternoon, we’ll open the boxes and identify what’s inside, how to set up your telescope, explain the eyepieces, and give you some field basics. With an experienced AAS member, you’ll look at a few objects in the evening sky, just to get started.

If you are new to your own observing but do not own a telescope, come on out anyway! You’ll get to experience EEO and share a scope with a new friend.

Then, at our AAS Austin Under the Stars evening on July 23rd, you’ll come out, and with your experienced partner, do a bit more: test your newfound skills by tracking the same objects as your partner, and talk a bit about what you have been learning with the public.

Out of The Box
July 9 - EEO at Canyon of the Eagles, 5-10pm
July 23 - Field, St. Stephens Episcopal School, 6pm-10pm
Bring: you, your telescope, and a device with SkySafari Pro, or the sky software of your choice!

Please contact Joi Chevalier (kitjer@snikte.net) and Dawn Davies (dawnmunroedavies@gmail.com) to let them know you’re coming, so that we have enough partners to help out.

Clear Skies!
2016-17 Executive Committee

Back Row, from left: Secretary Andrea Tole, Member-at-Large Terry Phillips, Equipment Chair Domingo Rochin, Member-at-Large Greg Rohde, Treasurer Dhaval Brahmbhatt.

Front Row, from left: President David Mathias, Vice-President Carl Lindemann, Member Services Chair Joi Chevalier.

Left: Member-at-Large Phil Schmidt, who spends part of the year in Denver and could not be present for the group photo.

Not pictured: Members-at-Large Tara Krzywonski, Alan Winter, and Amy Jackson.
ARE YOU AN AMATEUR ASTRONOMER OR AN ASPIRING ONE?
DO YOU HAVE A PASSION FOR STARGAZING AND A DESIRE TO LEARN MORE ABOUT THE UNIVERSE?
WOULD YOU LIKE TO LEARN HOW TO USE A TELESCOPE OR LEARN HOW BETTER TO USE THE ONE YOU HAVE?

Are you between the ages of 4 and 17 years?

If so, the AAS’s Jr. Astronomy Program is right for you. In the coming weeks we will be sending out notices and dates for upcoming meet-ups, classes and workshops for all members looking to take part.

Join us for an intro presentation and panel on the new program at our July Practical Astronomy Session on July 8 from 6:30p – 7:15p. For more information email us at contactaas@austinastro.org.
EXECUTIVE COMMITTEE MINUTES
By Ron Carman, Secretary

April 4, 2016
The meeting was called to order at 7:03 pm by President David Mathias. Other EC members present were: Terry Phillips, Ron Carman, Tara Krzywoski, Brian Lippincott, Alan Carruth, and Carl Lindemann, constituting a quorum. Also present were Joyce Lynch, newsletter editor, and Tim Brown, IDA Rep.

The minutes of the March 2016 EC meeting were displayed and approved.

Terry gave the Vice-President's report; the program in April will be given by Adam McKay, post-doctoral member of UT Astronomy department. We will have the May general meeting at St. Stephen's School; Amy Jackson will give that program and he will try to have Rachael Livermore come in June.

Tara Krzywoski gave the Treasurer's report; we still have our post office mailbox and she has renewed it for another year. We still need to find out where our funds are from Amplify Austin. David mentioned that we need to remove the former treasurer from the check signature list; it may be easier to wait until the new Executive Committee takes office and renew the signature list then. The committee agreed to this.

Joi Chevalier and Domingo Rochin arrived at 7:16 pm. Joi gave the Communications report; photos by AAS members will be posted in the Texas Museum of Science & Technology in Cedar Park April 23. Also the members' photo gallery on the AAS website is available to see now. The AAS brochure needs to be updated and she will bring samples to show at the next meeting. Maurice Nelson mentioned we only have one page on the website for observing sites (COE) and we should add more pages for other observing sites.

Dawn Davies gave the Outreach report via telephone; she has sent out e-mails listing various events for April and will pass to her successor any requests for events later in the summer. She asked Joi about the possibility of using the AAS website to volunteer for events as well as using on-line sites like Pinterest or Volunteer Spot. Joi mentioned that May 7 is Members' Night but we will need persons to help with an additional star party near the lake at COE Resort.

Domingo and Terry displayed the AAS website showing the part about the Loaner Telescope program with discussion about loan procedures and security deposits. Interested members should contact the Equipment Committee with questions or recommendations. Domingo said he updated the EEO training procedure and one person was trained in March. At the workday on June 4 we will have the path to the observatory covered with crushed granite and he will do an inventory at EEO on April 9.

Tim Brown said he has answered a few questions on dark sky sites, especially state parks.

Brian Lippincott said he will give a short talk on What's New in Astronomy at the general meeting.

Under Old Business: the Nominating Committee has issued ballots for the election and we still lack nominees for some positions. Domingo mentioned that after the nominees are announced at the April general meeting there will be time for nominations from the floor before taking a vote.

Under New Business: a question was asked about the number of members at a general meeting required for a quorum; that number will be determined by how many members we have in October.

Also, David mentioned that if we want to have a booth at Maker Faire this year we must apply by April 7, and the committee decided not to commit to it. The committee decided to send a thank-you note to Susan Franzen for speaking at our EC meeting in February; Tara will obtain the card. Joyce said she has heard that COE staff members have told persons that if they join AAS they will be eligible to attend members-only nights. This is true, but they should know that members-only nights are not conducted the same way as Public Nights. We need to discuss this fact with COE staff.

The meeting was adjourned at 9:17 pm.
GENERAL ASSEMBLY MINUTES

By Ron Carman, Secretary

April 8, 2016

The meeting was called to order at 7:34 pm by President David Mathias who asked visitors and new members to introduce themselves. Minutes of the March meeting were displayed on screen and approved.

The election of officers was held and the following officers were elected for the June 2016-17 term:
President: David Mathias elected to a second term
Vice-President: Carl Lindemann
Treasurer: Dhaval Brahmbhatt
Member Services: Joi Chevalier
Equipment: Domingo Rochin
Members-at-Large (6): Amy Jackson, Tara Krzywonski, Terry Phillips, Phil Schmidt, and Andrea Tole.

There was a vacancy for a sixth member, and Alan Winter agreed to accept the position. The positions of Secretary, Outreach Chair, and Communications Chair still need to be filled.

Terry announced the May meeting will be at St. Stephen’s School and Amy Jackson will give the program. He is trying to contact Rachael Livermore for the June program.

David showed a projector that has been donated to the AAS by Nathan Morgan.

Tara Krzywonski gave the Treasurer’s Report; bank accounts currently total $31,593 and the AAS membership is now over 600 as of April 1.

Joi Chevalier gave the Communications report; she has received a good response to the request for photos for the exhibit at the Texas Museum of Science & Technology; 19 persons have sent her pictures. Also, she is still working with Maurice Nelson on the website; any member who wants can send her something for it.

Dawn Davies, Outreach Chair, listed the outreach events still to come in April and showed the website volunteerspot.com on the screens. We can use it to sign up for events on line; requesters can see results.

Domingo Rochin gave the Equipment Committee report; due to forecast cloudy weather there won’t be training at EEO on 9 April. Instead there will be training before the next public star party. There is one loaner scope currently available and he reminded everyone of the workday at EEO on 4 June.

Lauren Gonzalez, ALCor, presented the Binocular Double Star award to Jack Estes

Brian Lippincott gave the “What’s Happening in Astronomy” report: successful drone ship landing; NASA has found another cause for Earth’s axis wobble; Saturn’s Cassini space craft isn’t affected by a hypothetical ninth planet, and astronaut Scott Kelly back on Earth is being compared with his twin brother.

Vice-President Terry Phillips then introduced Dr. Adam McKay of the UT Astronomy Department, who gave the program on Comets and the Rosetta Mission.

The meeting adjourned at 10:02 pm.
It’s summer, and time for country folk to head to the big city. We’ve been out bailing hay in deep space too long, and the bright lights of the summer Milky Way are calling. Lots to see and do: endless clusters, nebulae, star fields, you name it. No downtown bus tours available here, but we do offer a small glossy with a few highlights noted. Be sure to also bring your own map though; there’s always plenty of interest on those hidden back streets. Enjoy!

NGC 6281 rating EASY
open cluster in Scorpius
RA 17h 04.8m Dec -37d 54.2’
(2000)
Magnitude 5.4

Southeastern Scorpius, particularly in the vicinity of the tail and stinger at Lambda Sco, is a region swarming with open clusters stretching along the central Milky Way. One of these is the binocular cluster NGC 6281. It was not included in either the Messier or Caldwell catalogs, but it is the brightest cluster in Scorpius to be left out of both.

NGC 6281 is visible visually: to find it, move your eyes or binoculars due east along a line extending from the 3rd magnitude pair Mu Sco, in the body of the Scorpion, toward the Scorpion’s stinger at Lambda Sco. You’ll find the cluster roughly 1/4 of the way along this line, or about 2 degrees east of Mu. In binoculars it appears as a tight swarm of 7th- to 9th-magnitude stars.

A 2.4-inch scope will show you a pretty cluster of about 20 stars arranged like Christmas tree lights over a background haze, and a wide pair including the brightest star on the NE side.

Large scopes, like a 12-inch, will show a cluster with a rough teardrop shape, and the above pair at the pointed tip of the drop. You can pick out about 30 stars, many 11th magnitude and fainter, visible in the 7x6’ area with no hint of haziness and plenty of space between the stars.

NGC 6281 has a radius of about 26 light-years and a total of about 214 solar masses.

M69 rating MEDIUM
globular cluster in Sagittarius
RA 18h 31.4m Dec -32d 21.0’
(2000)
Magnitude 7.6 dia 7.1’

The constellation of Sagittarius, in addition to hosting the center of the Milky Way, also contains 15 Messier objects, all of which are clusters of one kind or another, and a few of which are also associated with nebulae. Of these 15 Messier objects, 7 are globular clusters. Of these 7, just 3 reside in the boundaries of the familiar Sagittarius “teapot”: M54, M69 and M70. And of these 3, only M69 hasn’t been targeted yet in this column, so this month we rectify that.

M69 is one of the smaller and fainter globular clusters in Messier’s catalog. It can just be seen in a dark night with 7x50 or 10x50 binoculars. It looks similar to nearby M70 in a 2.4-inch refractor. In a 6-inch scope at 100x it is unresolvable, but at 200x you can begin picking up outlying stars. A 10-inch scope will show you a nearly stellar nucleus, and you can partially resolve the cluster at 200x. In larger scopes, M69 is the easiest of the 3 Messier “teapot” globulars (M54, M69, M70) to resolve into stars; just be sure to use high magnification.

M69 has a diameter of about 70 light-years. It lies about 29,700 light-years away and is a close neighbor of M70; just 1800 light-years separate the two clusters. Both of them lie close to the galactic center, at roughly 6000 light-years.

M69 is unusual for a couple of reasons: first, it’s one of the most metal rich clusters known - keeping in mind that to astronomers, a “metal” is anything heavier than helium. Second, it has almost no variable stars; only 8 are known, 2 being Mira-type variables with periods of about 200 days. By the way, if you’re curious, the other two Messier “teapot” globulars were our targets in July, 2007 (M54) and July, 2015 (M70).
NGC 6334 rating HARD nebula in Scorpius
RA 17h 20.5m Dec -35d 43.0' (2000)
Magnitude 8.9

NGC 6334 is a Milky Way emission nebula that's located about 3 degrees NW of Lambda Sco (Shaula), the first magnitude star that marks the Scorpion's stinger. Also cataloged as Gum 61-64, the nebula has been dubbed as both the "Cat's Paw Nebula" and "Bear Claw Nebula."

The Cat's Paw is one of the nearest HII regions to our solar system. It lies about 5500 light years away and is a large star-forming region about 50 light years across, covering an apparent area of the sky slightly larger than the full moon. It contains a vast supply of material needed for star formation, roughly equal to a mass of 200,000 Suns. Consequently it is one of the most active stellar nurseries in the Milky Way, producing new stars at a more rapid pace than the more famous Orion Nebula (Messier 42). It probably contains tens of thousands of stars, many concealed by the nebula’s dust.

Although it was discovered in 1837 by John Herschel observing from the Cape of Good Hope in South Africa, today the nebula is much more popular as a photographic target than a visual one. While there are countless web links to beautiful images of the nebula, visual descriptions are few and far between.

One visual observation, using a 15-inch and OIII filter in dark skies, calls the parts of the complex very faint, with no easy targets. The only details visible are said to be “faint structureless patches of light,” and the the nebula is described as generally "unspectacular and difficult." So it's probably best to save the Cat's Paw for your digital imaging equipment, unless you're one of those intrepid explorers really into faint fuzzies.

CONGRATULATIONS!
Ken Pendlebury
Heart and Soul
Eldorado Star Party 2015
Using the Hubble Space Telescope Palette --Two panel mosaic (each panel is about 9 hours of integration)

Gear:
OTA: Tak FSQ-106
Mount: Tak EM-400
Camera: QSI-683
Guiding: OAG with Lodestar
Filters: Astrodon Narrowband
Gamma Cygni Nebula

This is the center of the Gamma Cygni nebula (IC 1318) in the constellation Cygnus. This nebula is more than 3000 light years from us! I have 2 hours of data captured, stacked and processed in this image.

Images by Bob Van Gulick
Taken at Texas Star Party 2016

Sombrero Galaxy

This is Messier 104 taken with my AT106LE scope matched up with my modded Canon T2i DSLR. 2 hours of data in this image.
Members Gallery (continued)

Milky Way

This is a widefield shot of the Milky Way taken with my Vixen Polarie. I took the same shot last year with my kit lens at F5.0. This is with my new Tamron lens at 17mm, F3.5, enabling me to pull a lot more details! I captured 2.5 hrs of data in this image.

Images by Bob Van Gulick
Taken at Texas Star Party 2016

Rosette Nebula

I’ve wanted to capture this winter image ever since I got my camera modded, but could never seem to get good winter skies. During TSP this was coming down early so I captured several frames each night and stacked them. There is just under 2 hours of data here. Lots of processing in Photoshop to bring out those beautiful reds!
Members Gallery (continued)

Zion National Park

By Michael Schaffer

August 2015
Canon 6D, Canon 24mm L II Lens at f2.8, ISO 6400, 20 Seconds

Moon

By Marc Crisantes

April 23, 2016
Meade LS-6 LightSwitch, Sony a6000
Lewis Ranch Observatory, Burnet, Texas.
How to Print and Display Astrophotography
By Rob Pettengill

You’ve spent hours acquiring and processing the perfect image. It looks great on your big new computer monitor, but you have to pan around to see the whole image in full detail. You want a beautiful print for mom and dad’s living room wall to thank them for buying that first telescope.

Do you just take your digital file down to the photo lab or run it off on your color printer? Without care astro prints can be disappointing when compared to their digital versions on screen. What works well for a family snapshot can be like having your telescope’s objective cloud up with dew for astrophotographs. When printed with the right care astrophotographs can glow with all the detail seen at your telescope.

If you want prints that get a “Wow, is that real? Did you do that?” reaction, then read on.

Where did my dynamic range go?
The human eye can see a tremendous range of brightness. One measure of this is the dynamic range or contrast ratio between the brightest and darkest colors. Exact numbers are difficult because they depend on the details of measurement, but this ranges from the order of a million to one if the eye is allowed to adjust to about 15000:1 in a single glance at a small area.

A high end camera might be able to capture a range of 16000:1 (14bits or stops), but in practice is usually a bit less than the eye can see, because the eye can adapt as it focuses on different features in the scene. It takes a lot of work to capture and process your data, to get an image to look good on your monitor. An LCD monitor can have a 300 to 1000:1 dynamic range and some have extend color gamuts. As long as the image is carefully processed, details are preserved and our adaptable eyes don’t notice the change in contrast.

Printing to paper can reduce contrast to as low as 60:1. Seeing less than 1/2 % of the original contrast makes it hard for even the non-critical eye to be awed by the glories of nature. With the right post processing, printing, and mounting choices your image can still look great. Let’s take a quick look at the key steps.

Calibrate your monitor
Camera sensors and displays are roughly linear devices, but your eye is non-linear. Gamma curves are used by your computer to correct for this. Make sure that your computer and screen is calibrated to a suitable gamma, usually 2.2. This requires setting monitor brightness and contrast for the lighting in your room, and then adjusting each color output by your computer. This will make sharing and printing your image much easier. An accurate calibration requires a special tool, but it is possible to do an approximate job by eye with software tools. There is probably one of these hidden in your operating system display preferences.

Display Calibration Utility on OS X
Astrophotography (continued)

There are lots of resources to help you learn to post process your images to display well on your calibrated screen. Let’s skip to our starting point for printing: your final image optimized for your calibrated screen.

Media choice matters a lot
Before you proceed you must decide how you are going to print your image. Your post processing with stretching and gamma correction has created a beautiful image on your monitor which has roughly 10 times less dynamic range than your original image. Making a print requires squeezing all that astro goodness into even less dynamic range. Images printed on paper range from 50:1 to 200:1 in contrast and differ in color rendition. A four times difference in dynamic range really matters. Picking a printing paper or other medium, that gives the brightest whites and blackest blacks with good colors, can make the difference between a dull image and “Wow!”

Optimize for printing using an ICC profile
With your display calibrated and your target media identified, the next step is to produce an image file optimized for printing. Differences in color rendition of different media are described by color gamut, a measurement of the colors that can be displayed. Color gamuts are represented by a description called an ICC profile. Many photo labs and printer manufacturers publish ICC profiles for their products. If they don’t, you probably need to use a different lab. Image processing applications like Photoshop allow you to install ICC profiles and see a preview approximating what your printed image will look like. This allows you to adjust a version of your image which prints well without details and colors being lost.

Monitor and Printer Color Gamuts Compared

Another thing to keep in mind is the large differences in dynamic range between different print media. A lot of the impact of astro-photos is in the dynamic range of the image. In addition to paper based prints you can now choose media like plastic coated metal that can give dynamic range much closer than electronic display. High dynamic range metal prints have that “glow” that gives the emotional impact of looking through a telescope eyepiece.

Pick your size, crop and scale
Prints should not show pixelation at a normal viewing distance. Depending on the size and location this is typically 150 to 600 pixels per inch. Photo labs will scale your image to fit the size print you request. You can get much better results by scaling and cropping your image to the resolution and aspect ratio that the lab will print. This allows you to have exact control of cropping and to pick the scaling algorithm that gives the best results for your image.

Print without lab color correction
By default most labs will color correct images. This is done because most image files have not be color corrected, and they want to ensure that flesh tones look natural and avoid returns. Astro-photographs have no flesh tones and you have already applied your own color correction.
ASTROPHOTOGRAPHY (continued)

using the ICC profile. Be sure to specify no color correction. You have done a better job than any algorithm or photo technician can. Correcting with an ICC profile is not perfect. Ask around to find labs that produce high quality, consistent prints. If your image has delicate colors, you may want to get small proof prints before committing to a large print.

Use a glossy surface finish
Matte finishes don’t show strong reflections but catch ambient light from all directions. Contrast is reduced no matter how lighting is arranged. Glossy prints show much higher contrast with good lighting.

Glossy vs. a Matte finish

Your print must be flat
Either print on rigid media or mount on a rigid flat backing that prevents any curl or wrinkles in the print. Gator board and foam backings perform well. Heavier papers are more rigid. Any wrinkling will catch stray reflections and interfere with the enjoyment of your print.

Frame or not - don’t use glass
Framing and mounting your print can be the most costly part of a print. Fortunately there are lots of choices and you can have high quality prints inexpensively if you make the right choices.

A traditional framed image adds considerable expense for the frame and mat. If a glass is used the contrast of your image will be reduced and astro-photos have precious little to lose. Glass with anti-reflective and ultraviolet protection coatings is available and much better than frosted or clear glass, but expensive and it still reduces the contrast of your image. If a paper print is irreplaceable (think of an original Ansel Adams “Moonrise over Hernandez, New Mexico”) then you probably want to put it under glass and control humidity in the room.
Fortunately there are media and mounting alternatives available which can eliminate most of the cost of framing while giving the best view of your image. An alternative to the traditional framed print is a floating mount. By eliminating the cost of frame, glass, and matting costs can either be reduced or put into higher quality printing, papers or metal prints.

For paper prints, foam or gator board backing mounts can provide a rigid easily wall mounted platform for your image. These are inexpensive and put nothing to reduce contrast between the viewers eye and your image.

If you want a more durable and higher dynamic range print than exposed paper on a rigid mounting, metal prints are an superior alternative. They are strong and rigid. They are easy to clean, with the image dyes diffused into a plastic layer on the metal with none of the disadvantages of glass. Accelerated aging tests show that dyes in a metal print retain their colors for up to three times longer than colors in a paper print.

Metal prints are easily framed, no glass needed. The frame is simply hung on the mounted picture with no glass giving the look of a traditional framed print with a higher quality image.

**Light your image well**
When you hang your image make sure that it is well lit. You may even want to consider the type of lighting (window, incandescent, LED, fluorescent) in doing your final color tweaks. Lighting at eye level from across the room can cause reflections on your high contrast glossy print. With lighting from above, reflections are minimized

Next time you see an astronomical print, do you feel like you are looking through a telescope or space ship porthole? If not think about what you’ve learned here and how different choices affect the result. Make the right choices, to preserve contrast and colors, and your prints will generate the excitement that looking through a telescope can bring.

This and other “how to” articles are available on [http://astronomy.robpettengill.org/](http://astronomy.robpettengill.org/)

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**In Your Own Backyard: Images from the Austin Astronomical Society**
Texas Museum of Science & Technology
1220 Toro Grande Dr.
Cedar Park, TX, 78613
Through March 2017
[http://txmost.org](http://txmost.org)
Having just finished his second term as vice president and moving into a Member-at-Large position, Terry Phillips brings his long experience to the beginner’s point of view. “For over 50 years, science-minded youngsters have started with dinosaurs and the solar system,” he said. “There are two paths you can go down. You have observational astronomy, and you can be an imager. I am a visual astronomer. I want to help people figure out the sky rather than figure out exposure settings. I have a friend who is working a woman in her eighties on binocular viewing.”

Buying a telescope is the first mistake a beginner makes, according to Terry. He said that we too often hear beginners say, “I got this telescope and I can’t find anything.” That is why he recommends starting with the constellations and the brightest stars. “Once you have a framework you can look for interesting things to see.” He adds that when you learn more and are “hunting faint fuzzies, the Moon is your enemy, but it is always there for a beginner.” He also has a pretty good story about some very advanced astronomers who apparently were still beginners. That sense of wonder, the opportunity to learn to see the obvious, shines through his words when he speaks of his enjoyment of our hobby.

“I was about eight or nine, living outside of a small town in East Texas; and one night we had headlights in our driveway, which was unusual. It was a man selling Encyclopedia Britannica. He told my parents that a kid like me, who knew dinosaurs and the solar system, needed a telescope. About a year or so later, they bought me a telescope from the Sears catalog, a 60mm 2.4-inch refractor with an equatorial mount and a clock drive. It was $89. Today that would be about $600 or $700. I built a pad for it, pouring a concrete slab, and polar aligning a 3-inch pipe. The drive gave me a good 30 minutes of viewing.”

Astronomy went dark while he majored in nuclear engineering at Texas A & M, but reappeared when he bought a 10-inch Meade LX5 in 1986, and used it for the Mars opposition in 1988. In 1989 he went to the McDonald Observatory to watch a fifth-magnitude star be occulted by the rings of Saturn. “They did not have the visitors’ center back then, but they had a 24-inch Dobsonian out there, and I was flabbergasted,” he said.

His next telescope was a 12-inch Meade LX200 GPS. In 2003 he took it out to an Austin Astronomical Society star party at the Eagle Eye Observatory and has been a member ever since. (You can tell that he is a native Texan because he calls Canyon of the Eagles “Lake Buchanan.”)

Terry is a founding member of Stellar Skies LLC, a project started three years ago to make a dark sky site available to amateur astronomers. Members buy in to a 3.5-acre site out in San Saba County, where the corporation members built observatories for themselves. Their projects include offering remote control viewing to astronomers in Florida, Oregon, and elsewhere, via fast Internet for imaging.

Terry with his recent special project, the AAS 25-inch Dob.
As sophisticated as that is, Terry readily admitted his continuing status as a beginner. “I have no Astronomy League certifications,” he said. (When you join the AAS, your membership in the AL is included.) He watched as I jotted his words in the same bound grid paper notebook that I use for my observing. “I am the type who does not write anything down,” he confessed. Now that he is aging out of his eidetic memory, he has given more thought to recordkeeping. “I am committing everything to voice control and vocal transcription.”

Terry likes star parties. “You are out with 500 like-minded people,” he said. “You get to hear top-notch speakers. You usually have a week of the best observing.” Among the festivals are Stellafane in Vermont and the Florida Keys Winter Star Party. Here we have Okie Tex, at Camp Billie Joe in the western Oklahoma Panhandle near Kenton, coming up September 24 through October 4. Terry has attended several of those. He is also a regular at our own star parties, of course.

He runs one of the telescopes at Eagle Eye and explains the sky to the public. “I try to convey my enthusiasm and my little bit of knowledge. You get people who want to stay late and ask questions. That comes and goes in cycles. Ten years ago, you got people who stayed until sunrise.”

“Right now, Mars is at opposition,” he said. “A lot of people at the Texas Star Party at Fort Davis were unaware of that. They were looking at deep sky objects, and I asked them, ‘Do you realize that Mars is 21 seconds [of arc] across right now?’ Some of them used an occulting bar, and were able to catch one of the moons.”

Terry lived in Singapore for three years. He said that it is a stable environment with 12-hour days and 12-hour nights, and constant weather that never brings a cyclonic storm. But he said that he had a great view of Alpha Centauri.

Like all beginners, the last experience just fuels his anticipation of the next opportunity to be astounded. Terry viewed the July 21, 1991, solar eclipse from a dive boat off the southern coast of Baja California. Now he is planning on being in the path of totality for the August 21, 2017, solar eclipse which will pass over the central United States. “We will have a total eclipse right over Canyon of the Eagles on April 8, 2024,” he added.

As a club stalwart, Terry is also looking at the possible paths of our future. He continues to compare and contrast other likely sites against Canyon of the Eagles. He wants to balance the outreach effort with our own observing programs. And he is interested in exploring mobile outreach with trailers. Typical of a beginner, on top of all that, he has a new interest in forensic astronomy.

Terry with (from left) Bryan Verhoeff, Jim Sheets, and Domingo Rochin while working on the club’s 25-inch Dob.

Photos: Ed LeCroy
If you want to collect data with a variety of instruments over an entire planet as quickly as possible, there are two trade-offs you have to consider: how far away you are from the world in question, and what orientation and direction you choose to orbit it. For a single satellite, the best of all worlds comes from a low-Earth polar orbit, which does all of the following:

- orbits the Earth very quickly: once every 101 minutes,
- is close enough at 824 km high to take incredibly high-resolution imagery,
- has five separate instruments each probing various weather and climate phenomena,
- and is capable of obtaining full-planet coverage every 12 hours.

The type of data this new satellite – the Joint Polar Satellite System-1 (JPSS-1) -- will take will be essential to extreme weather prediction and in early warning systems, which could have severely mitigated the impact of natural disasters like Hurricane Katrina. Each of the five instruments on board are fundamentally different and complementary to one another. They are:

1. The Cross-track Infrared Sounder (CrIS), which will measure the 3D structure of the atmosphere, water vapor and temperature in over 1,000 infrared spectral channels. This instrument is vital for weather forecasting up to seven days in advance of major weather events.
2. The Advanced Technology Microwave Sounder (ATMS), which assists CrIS by adding 22 microwave channels to improve temperature and moisture readings down to 1 Kelvin accuracy for tropospheric layers.
3. The Visible Infrared Imaging Radiometer Suite (VIIRS) instrument, which takes visible and infrared pictures at a resolution of just 400 meters (1312 feet), enables us to track not just weather patterns but fires, sea temperatures, nighttime light pollution as well as ocean-color observations.
4. The Ozone Mapping and Profiler Suite (OMPS), which measures how the ozone concentration varies with altitude and in time over every location on Earth’s surface. This instrument is a vital tool for understanding how effectively ultraviolet light penetrates the atmosphere.
5. Finally, the Clouds and the Earth’s Radiant System (CERES) will help understand the effect of clouds on Earth's energy balance, presently one of the largest sources of uncertainty in climate modeling.

The JPSS-1 satellite is a sophisticated weather monitoring tool, and paves the way for its sister satellites JPSS-2, 3 and 4. It promises to not only provide early and detailed warnings for disasters like hurricanes, volcanoes and storms, but for longer-term effects like droughts and climate changes. Emergency responders, airline pilots, cargo ships, farmers and coastal residents all rely on NOAA and the National Weather Service for informative short-and-long-term data. The JPSS constellation of satellites will extend and enhance our monitoring capabilities far into the future.

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After seeing a few objects I had in the past written off as too hard for my equipment I have learned that it is always worth a try, with preparation. So for this year’s good opposition of Mars I decided that I would give it my best shot at seeing its satellites, Phobos and Deimos. 

For an attempt at Mars’s satellites I needed three conditions, Mars near opposition, a satellite near maximum elongation from Mars, and good skies with both good seeing and good transparency. As Deimos is considered easier than Phobos, I considered it as the primary target. For stellar type targets it isn’t so necessary to be out of the suburban light pollution (I saw Sirius B from my Cedar Park backyard a few years back) but since I wanted to give it the best chance, I planned to drive out to a dark sky site.

I kept track of the elongations of Mars’s satellites through the website, http://pds-rings.seti.org/tools/tracker2_mar.html, which provides a continuous plot of Phobos and Deimos around Mars, like the plot for Jupiter’s moons in ‘Sky and Telescope’ each month. The moons of Mars move fast so I needed an elongation near to the time Mars would transit over us in central Texas. My first attempt was on May 20 to see Deimos at maximum elongation. This was during a full moon. I did not see Deimos, but the seeing was quite good and I got very nice views of Jupiter with its Red Spot, Mars with Syrtis Major, Saturn with Cassini’s Division all the way around the rings, and the full moon itself, the highlight being the brightly lit central peaks inside the crater Copernicus. However, no luck on Deimos, partly because I didn’t know quite where around the disk of Mars to look and maybe because of the nearby full moon.

Given our weather this May, things didn’t look so good for another chance, but on the Friday of Memorial Day weekend the www.cleardarksky.com website predicted clearing for several hours overnight. And both Phobos and Deimos were to be near maximum elongation around 1 AM! Despite overcast in the morning, as predicted, the sky cleared up in the late afternoon. So that night I loaded up my 16” Dobsonian and headed out. With me I had a chart I had pulled down from http://pds-rings.seti.org/tools/viewer2_mar.html. This provided the crucial information I had missed on the first attempt - the apparent position angle of the Martian satellites. So I knew exactly where to look. I got to my dark sky site around 11:45 and set up. The sky was beautiful, clear and transparent with Scorpius rising in the southeast. My site is almost due west of Leander so there is a bit of a light dome to the east but south and the rest of the sky is usually dark. It turned out to be a very clear night – one of those where I see some light on the horizon and think, “Uh oh, clouds coming in,” but then realize that it is the Milky Way rising!

Above: Oriented north up. The positions of Mars and its satellites for 1:10 am CDT, May 28, 2016 as seen from Cedar Park. Downloaded from http://pds-rings.seti.org/tools/viewer2_mar.html
So I set up my equipment for this attempt, my 16” looking through a 9 mm Antares Orthoscopic eyepiece and a 2x Ultrascopic Barlow. This setup yields about 400x. I have other eyepieces, Naglers and a Panoptic but have found that for the planets and small difficult objects in glare the Orthoscopic is better – I learned that when looking for Sirius B. My 16” does not have sidereal tracking but I do have it on a powered ground board so I can get tracking in azimuth which is almost sidereal for objects near due south.

The configuration of my telescope with a four vane diagonal puts four strong diffraction spikes right at 45 degrees from up and down. This is almost exactly where the moons of Mars were to be when it was at upper culmination, due south. I looked for them with no luck, with the 9 mm by itself and barlowed. So I spent some time rechecking the positions to look at and looking at other objects. I could see the companion of Antares, which is rare for me, and Saturn was nice with a collection of moons. As time went by I could tell that the location of the diffraction spikes around Mars was shifting in relation to the background stars as the planet moved across the sky. It was a nice night and I had time so I planned to keep trying until it became hopeless. Around 1 AM I was looking at the background stars and along the diffraction spike toward Mars and there it was – a faint pinpoint popped up just beneath the southeastern diffraction spike! I checked the chart I had and it looked in the right place for Deimos. I could see it fairly reliably but only if I had Mars just barely outside the eyepiece field of view. Two diffraction spikes still cut across the FOV, but with use of averted vision the pinpoint was there. I looked for Phobos with no luck, but it was trickier because it would be right at the edge of the eyepiece FOV if visible. So I quickly sketched a drawing of some background stars and the location of Mars and the suspicious pinpoint, which wasn’t easy because everything was dewing up; did mention it was a bad night for dew?, it was. After the first sketch I decided a better one was necessary, but my diagonal had dewed up. I pulled out the diagonal and held it in front of my car heater to clear it. Then I reinstalled it and quickly made a better sketch of the scene. Just a few minutes later the fog began rolling in and a foggy gibbous moon started rising. The night’s observing was over. I packed up and went home.

I wasn’t done though. There had been a few background stars near Mars. I wanted to make sure that the pinpoint I saw couldn’t be a background star. For that, I brought up the online STScI Digitized Sky Survey (https://archive.stsci.edu/cgi-bin/dss_form) and downloaded a sky survey photo centered on the predicted (and my observed) position of Deimos. To my delight the sky photo showed background stars as I had sketched them and no possible star at the location of Deimos – this confirmed my observations of the satellite. All that was left to do was get some sleep and clean up my sketch the next day.

Oriented north up. The downloaded scan from the STScI Digitized Palomar Sky Survey centered at the location of Deimos at the time of the visual observation. This field is 15 arcminutes square. Downloaded from https://archive.stsci.edu/cgi-bin/dss_form

So what do I consider essential to my successful observation of Deimos? Aside from the conditions I stated before (satellite at maximum elongation, etc.), I’d point out some details of my equipment – first, a 16” scope, plenty of aperture for a magnitude 12.7
**Deimos**(continued)

object. I'd learned looking for Sirius B that aperture mattered, I'd tried with a 10" and that was iffy, the 16" clinched that observation. Choice of eyepiece and lots of power – the Orthoscopic was crucial for two reasons, one, just the clarity of a good Orthoscopic, they don't have wide fields of view, but the view they give is clear. And with their fewer glass elements they scatter less light than my high tech Naglers and Panoptic. The small field of view of an Orthoscopic is an asset in this case, it allowed me to put Mars outside the FOV but leave Deimos close enough to on-axis where the telescope imaging was good. Wide field eyepieces wouldn't work as well for this. The publications (S&T, etc.) recommend putting an occulting bar in your eyepiece but a narrow FOV eyepiece can work, too. Perhaps obvious, too, but I couldn't see Deimos until it was out of the bright diffraction spike of Mars in my scope. Tracking; as I mentioned, the powered ground board of my Dob is almost as good as real sidereal tracking for objects near due south. I noticed that when I tried to hand track at 400x it definitely reduced my ability to see faint objects. And my mirrors were clean – I had the secondary recoated last year and had washed both mirrors fairly recently.

Any advice I would give for someone else on this would come from what I wrote above. I probably had the simplest setup which would be successful. I would think a medium sized (10-12", or greater) quality Newtonian or Schmidt-Cassegrain should work.

As for Phobos, I guess I'll try for it again in 2018, at that great opposition of Mars.

Oriented north up. The sketch of Mars (with diffraction spikes), Deimos, and six background stars I made showing the scene at about 1:10 am. Deimos is the small dot to the lower left of Mars and just to the left of the diffraction spike. This sketch is a composite of more than one field-of-view. The actual FOV at any one time was about one half the diameter of the sketch and Deimos could not be seen if Mars was in the same FOV.
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