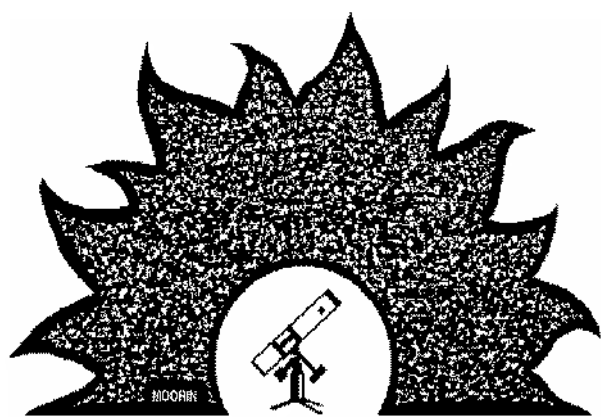




PAStimes

Phoenix Astronomical Society

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PHOENIX ASTRONOMICAL SOCIETY — ESTABLISHED 1948

The Art and Science of Astrophotography

The process of setting up and taking the initial exposures of celestial objects is certainly a science, but that's generally where the science ends and the art begins. The processing of images is largely a matter of personal preference as much as an endeavor at faithful reproduction of the object. In this presentation I'll introduce the typical equipment used for astrophotography. Then I'll review the setup and process of taking the series of images. Lastly, I'll demonstrate my procedure for 'developing' the initial image into a finished product.

Jeff Stillman, a resident of Chino Valley, is the current president of the Prescott Astronomy Club. He has also served as the Public Relations Officer for the Naperville Astronomical Association in Naperville, IL. Like most current amateur astronomers his interest in astronomy began in his

youth, fueled by the NASA Apollo missions of the 1960's. Currently, on any given evening you can find him either rolling off the roof of his observatory to take a night's worth of images, or participating in the many public and private events sponsored by his club. His observatory houses two telescopes: a 14" Celestron CGE SCT and an Orion 110mm APO, both on a Losmandy Titan mount. Depending on the target, he'll use either a modified Canon T2i DSLR, or an SBIG ST-8E imager with four narrowband filters.

Everyone is invited to this meeting. Bring a snack to share or donate to the snack fund (what change you have on you). Bring a friend! Doors open about 6:45pm. Set-up time and socializing are from 6:45 to 7:30. Meeting begins 7:30pm with a few brief announcements and then the guest speaker. See you there!



January PAS Meeting Review

By Terri, Event Coordinator

This was one wonderful PAS Meeting. We had 3 new members join the club. Congratulations to: Jason Teed, Al and Cindy Smith and Mackenzie Cabrera. Due to illness, Eric and Ora Steinberg and Ed and Bette Wurst were unable to attend, but we did have long-time member Kevin Harcey with us.

The meeting was opened quickly, but before it was turned over to the guest speaker, a birthday card for Frank Insana was passed around for those who wished to sign it. Frank's birthday is on Jan 31 which is the PAS Social, so Sam Insana brought the card for him. Awesome idea - Frank who will

be celebrating his 27th birthday joined the club when he was 3 months old!

President Bruce read a thank you card from Susan Rubin, our contact at DBG for the Luminaria events. It says: "Dear Terri and all the members of the Phoenix Astronomical Society. Thank you so much for braving the cold of 'Space Mountain' and illuminating the heavens for all our guests at Luminaria. It was a wonderful experience for all our guests and you were all wonderful to work with. I hope we can work together again in 2015. Best Wishes, Susan."

Roger Anzini then did his presentation



(Continued on page 7)

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February Upcoming Events

By Terri, Event Coordinator, RSVP to Events@pasaz.org

Feb 5: PAS Meeting in Room LS-205, Doors open at 7pm, Meeting starts at 7:30pm. Read about the Guest Speaker on page 1 in this issue. Everyone welcome. Bottled water provided by President Bruce. Bring a snack to share.

Feb 6: Jupiter at Opposition

Feb 8: Free Telescope Workshop at Bookmans, 19th Ave and Northern in Phoenix - 3:30pm to 5:30pm. RSVP is required with Terri. When you RSVP, email the make and model of the telescope you need assistance with. We also assist with suggestions and advice on what telescope to purchase to match your needs. We have no telescopes for sale at this event.

Feb 11: CTCA Private Star Party - PAStimes Star Tour Members Only

Feb 12: PAS Meeting of the Minds 7pm in LS-205. Open to anyone, Business Meeting, please no Children. Bring a snack to share, bottled water provided by President Bruce. Doors open 6:45, meeting will begin about 7pm and can go to 10pm.

Feb 15: Star Party at Desert Ridge (Private)

Feb 19: Huge Public Star Party at Black Mountain Campus of PVCC 60th Street and Carefree Hwy from 7pm to 10pm. Set up is 6pm for telescopes. Everyone welcome. RSVP is requested with Terri. This event is Weather Permitting. When you RSVP by email, please include the number in your party. We usually provide 10-14 scopes for your viewing pleasure. Please do not touch the telescopes.

Feb 20: 2 Schools Star Parties (Private)

Feb 22: Conjunction of Venus & Mars

Feb 24: School Star Party (Private)

Feb 25: CTCA Back Up Date (Private)

Feb 26: PVCC Free Telescope Workshop at PVCC Main campus, 32nd Street and Union Hills Rd - 7pm to 10pm with Public Star Party. RSVP is required with Terri Events@pasaz.org. Seating is limited. When you RSVP, please leave your first name, and the make and model of your telescope. Bring your telescope and accessories to this event. We meet in G-147 and by the Telescope Dome on campus. We have no telescopes for sale at this event. This event is Weather Permitting. ***

PAS Meeting of the Minds Feb 12 2015

By Terri, Event Coordinator Events@pasaz.org

Plan to attend this awesome meeting. Once every 3+ months, PAS Members get together to discuss the business portion of what goes on within PAS. Topics are needed, so send your topics for discussion to me by two days prior to the event.

This is a business meeting, so children are asked NOT to attend. However, the meeting is open to any adult who wishes to listen and/or contribute. You do not have to be a PAS Member to attend this meeting. This is also a party, so bring a snack to share. Bottled water is provided by President Bruce. If you don't want water to drink, BYO drink. Also, this is a great time for show and tell and mini-presentations. If you have something in photos or a Powerpoint presentation you'd like to share with

the club that isn't over an hour long (in which case you'd be doing it at a regular PAS meeting), then send the length of your presentation and the title to me so we can sign you up to do it. All astronomy-related topics are welcome. Anyone wishing to do a presentation should contact me by two days prior to the event, to get on the schedule. We also share videos, movies and other fun stuff to close out the evening.

The agenda for this month's event can be found at the link below, however here is a brief idea of what we are doing so you know ahead of time. PAS members and their guests will be able to attend the first portion of this meeting consisting of any topics to be discussed that are unrelated to the PAStimes Star Tours group. This will

include an awesome mini presentation by Kevin Witts.

Then, we will take a 5 minute break for snacks and bathroom. When we come back, we will be asking everyone who is NOT a Star Tours member, to depart. Many thanks for your understanding to those who are not Star Tours members regarding this portion of this meeting.

Here's the link to this month's MOM's Agenda:

<http://www.pasaz.org/forums/downloads.php?do=file&id=60> The next Meeting of the Minds (MOM's) is scheduled for Sept 10, 2015. See you at the February Meeting of the Minds!

Walk around DBG Nov 15

By Terri, Event Coordinator

It was a wonderful day for a walk around Desert Botanical Gardens with our guides, Susan Rubin (In charge of the Luminaria events), Emily Morris (In charge of the Kids Education events until the end of December) and her replacement Nina Avila. We started out checking out the beautiful renovations made to the area of the gardens that used to be called the Boojum Tree. The trees were still there, but the new name has become "Desert Terrace Garden". I requested we continue the Adult and child education classes in that same area since in addition to looking really nice, it is large enough to have 24+ patrons and several scopes. Attending this "walk around," from PAS, were William and Terri Finch, Howard Moneta and Eric Steinberg. Eric and Howard attended to find out how big the carts were that would be carrying their larger scopes up the hill to the observing location, while William and I attended to find out about the Boojum Tree location. Since Susan and Emily were able to coordinate meeting us on this one day together, we were able to see both the new Terrace Garden area and "Space Mountain." Many thanks to Emily, Nina and Susan for arranging this meeting, taking us on the tour so we would know what was happening and how it would happen. They are wonderful ladies to work with.

After we checked out the Boojum Tree area, Emily and Nina went home, and Susan walked with us up to "Space Mountain." While up there, we investigated how to fit 4 scopes in that area for the 16 nights of the Luminaria events. It took some time, but we worked it out as follows:

The overlook area fit 2 smaller scopes, as long as the scopes were set up as close to the railing as possible. So through this event, Terry with his 5", William and I with the 10" and 8", Sam with his 8", Howard's 8", and Kevin's 8" were at this location (see photo). From this area we could see east and a little southeast, north and a little northwest with southwest blocked by the mountain we were up against. The nice thing about this location was that we had a crowd around us most of the time which

seemed to keep the area warmer than the other two scope locations. When the crowd left, it felt like the temperatures dropped.

The second location we called "Top of the Hill". From this location, mostly only north was visible. The east had a tree in the way and south/southwest had the Mountain. We put the larger scopes up here. Eric with his 22", Howard with his 14" and Roger with his 16". We had Kevin and Mike set up displays one of the times when it was a cloudy night; they took up the whole area, but it looked great and they said they had a super large crowd around them. They were able to use the propane heaters provided by DBG, whereas those of us with scopes, (due to interference from the heat) couldn't use them and still have a great view for the night.

The third location was under the ramada. In the photo, you can see the area where the scope was set up. This scope could see east somewhat, and north, except where the cactus got in the way. Bruce took this one most of the time.

We enjoyed our tour of "Space Mountain" and then we (the PAS Members) went to dinner at a new location. Howard, Eric, William, Terri and Ora met us at Saba's Mediterranean Restaurant. The food was very good and we had a great discussion about the upcoming DBG Luminaria events as well as other interesting things.

This was a fun, exhausting, freezing event for most of the 16 nights, but we met some great people (Patrons, workers and volunteers at DBG). Many thanks to DBG for having PAS at this event. We got some great compliments while doing this event, from the attending public and volunteers. We hope to do it again next year! ***

Sci-Fi Movie Trivia: Armageddon (1998) - Rockhound's line about sitting on a million pounds of fuel in a rocket built by the lowest bidder is a variation of an actual radio transmission by Mercury astronaut Alan Shepard, just prior to lift-off.

Sci-Fi Movie Trivia: Armageddon (1998) - The film crew was allowed to shoot sequences at the top of a real launch pad with an actual space shuttle docked to it. The only condition was that they not step into the shuttle itself. Ben Affleck admitted

to stepping inside the orbiter for a brief moment before NASA technicians ordered him out of the spacecraft.

Sci-Fi Movie Trivia: Armageddon (1998) - The shuttle launches were filmed for real. Disney (Touchstone Pictures) were



Photo has (L to R) Eric Steinberg, Susan Rubin, Howard Moneta, William Finch & Emily Morris. Photo by Terri.



William & Howard check out the Overlook area of "Space Mountain." For the Luminaria events, we fit 2 smaller scopes (up to 10") in this location. Photo by Terri.



William, Eric and Howard check out the "Top of the Hill" location and we conclude a larger scope could set up here, however, only 1 scope would fit at a time. It just isn't big enough to have people and more than one scope at this location. Photo by Terri.



And here is the Ramada location for a scope. We had one scope here every night of this event. Photo by Terri.

allowed to put cameras (about 16 of them) all over the place. The camera on the launch pad was shook so hard (25G) that all the screws fell out of the lens and it had to be returned to Panavision in a box of pieces which they put back together).

DBG Luminaria Nov 28 & Nov 29

Event of 2014 (16 Nights)

By Terri, Event Coordinator and various attendees

Terri writes: On Friday **Nov 28** at DBG, Bruce Wurst (12"), William Finch (10"), Sam Insana (8") and Terri Finch (8") attended to do the Luminaria event. Temperatures were nice starting out and didn't really get cold up on the hill until about the last 15 minutes of the event.

DBG hired PAS to do 16 events for 2014 of which this was the first. The dates of these events are Nov 28, 29, Dec 5, 6, 12, 13, 19, 20, 21, 22, 23, 26, 27, 28, 29 and 30. The set up is 4 scopes per night and if too cloudy, a presenter, which would be Mike Marron or Kevin Witts (scheduled for every other date). Many thanks to Susan Rubin for helping these events happen smoothly. The Luminaria event would be "Sold Out" at 2,000 patrons per time frame of 5:30pm to 7:30pm, and 7:30pm to 9:30pm.

On this night, Sam was set up at the area I am calling "The Top of the Hill." Bruce was by the Ramada and William and Terri took the Overlook. We had a crowd of at least 2,000 people looking through the scopes, so there wasn't even time to move to another object! William stayed on the E.T. Cluster while Terri stayed on the Moon filtered in Red. Bruce showed the Ring Nebula for most of the night and Andromeda for another part of the night. It was a fun but super exhausting event.

Sam writes: I was stationed at the top of a steep hill at Desert Botanical Gardens during the Luminaria night. I had my 8 inch newtonian reflector and showed 4 different objects during the 4 hour presentation. I started with the moon, then went to Gamma Andromeda double star, then Andromeda

Galaxy and finally the Pleiades open cluster. I then showed the moon again for the last few minutes to people who wanted to see it. The weather was perfect, no clouds and no wind. Terri, William and Bruce were also there and showed other objects. I estimate about 1000 people viewed through my telescope throughout the night. Everyone seemed to have a great time, and had the holiday spirit. Customers ranged from about 4 years old to 80 years old. Several people asked for PAS cards so they could contact our club about future star parties. I sent them to Terri, who handed out lots of PAS info. A problem was that for 4 straight hours I was constantly on my feet and unable to take any break for drinks, food or restrooms! There was always such a long line of people waiting to view through my telescope that I was lucky to be able to change objects to view. I had to tell astronomy stories to the crowd while using my setting circles to find objects. Also, I dressed according to wishes of our DBG contact, with a black dress shirt and black pants and black dress shoes. But after 4 hours my clothes were covered with dirt from the ground I was standing on. My feet were aching so I think I will try wearing tennis or running shoes and a casual shirt or tee shirt like Bruce to be more comfortable and avoid ruining good clothes, unless of course our DBG contact again insists on the dress code. If she does, then I believe all of us should abide by it.

Terri writes: On **Nov 29** Saturday, the PAS Telescope Team at DBG consisted of Bruce (12"), William (10"), Earl DeLong (10"), and Terri (8"). This night had Earl at the "Top of the Hill", Terri and William at

the "Overlook", and Bruce at the Ramada. William and Terri set up and there was immediately constant flow, no breaks, no thinking, no doing anything but the telescopes! William stayed on a Crater on the Moon with a Green Filter, and Terri was on the Whole Moon with a Red filter for the entire night. No breaks, just a constant flow of a few less people than the night before. One guest said to me "Why do we only see half of the Moon?" I showed her, in the sky, that only half the Moon was lit during 1st quarter phase. Bruce stayed on the Ring Nebula most of the night. A pleasant surprise was that Howard Moneta and his mom drifted by to visit, during the night.

Earl writes: It was a warm and enjoyable evening under the stars at the Desert Botanical Gardens on Saturday November 29th. I attended with my 10 inch Newtonian push-to reflector with a Dobsonian mount. The carts arrived on time and transported us to the observing area on one of the hills of the DBG grounds. After setting up, I enjoyed the sunset and the views of the surrounding mountains. I started out the evening observing the first quarter moon and then switched to the double cluster in the constellation of Perseus once darkness arrived. There was a constant line of people at my telescope for the entire 4 hour event. There were visitors of all ages and a lot of Oooh's and Aaah's. I talked a little about the mythology of Perseus and showed the constellations with my laser pointer. I also explained what an open star cluster was, how far the cluster was from earth, and what the future holds for the cluster. I eagerly look forward to the next event.***

Telescope Workshops in 2015

By Terri, Event Coordinator

Here's a list of all the PAS Telescope Workshops for 2015. We hope you can attend.

Jan 11: Bookmans 3:30 to 5:30pm
Jan 22: PVCC 7 to 10pm
Feb 8: Bookmans 3:30 to 5:30pm
Feb 26: PVCC 7 to 10pm
Mar 1: Bookmans 3:30 to 5:30pm

Apr 12: Bookmans 3:30 to 5:30pm
Apr 30: PVCC 7 to 10pm
May 3: Bookmans 3:30 to 5:30pm
June 28: Bookmans 3:30 to 5:30pm
July 26: Bookmans 3:30 to 5:30pm
Aug 30: Bookmans 3:30 to 5:30pm
Sep 24: PVCC 7 to 10pm

Sep 27: Bookmans 3:30 to 5:30pm
Oct 18: Bookmans 3:30 to 5:30pm
Oct 22: PVCC 7 to 10pm
Nov 15: Bookmans 3:30 to 5:30pm
Nov 19: PVCC 7 to 10pm
Dec 13: Bookmans 3:30 to 5:30pm ***

DBG Luminaria Dec 5 & Dec 6

By Various Attendees

On **Dec 5** the following Telescope Team Members were at DBG doing the Luminaria Event: Bruce Wurst (12"), Terri Finch (8"), Sam Insana (8"), Don Boyd (8"), Kevin Witts as the Presenter with an awesome Moon display, Frank Insana as a helper and William Finch also as a helper. It was a super cloudy night. We put 4 telescopes with 4 different filters all on the Moon, but Kevin was the hit of the night. This night was warmer than it was previous nights, but the clouds were persistent and very much in the way of seeing anything else in the night sky. That said, we were able to view the moon and its craters through clouds for most of the night with only a couple of interruptions when they were too thick. I estimate about 1,000 in attendance.

Terri writes: I was on the Moon with a red filter, all night, showing what craters were visible on the very edge. William had work this day, so he arrived later, around 6:30 after a ton of traffic delays. Luckily, he was home when I texted to him that I had forgotten my battery box, so he brought that with him and saved the night! It was all about the full moon on this night!

Sam writes: There were 9 weather forecasts of cloudy weather, but they said high clouds which would be thin enough to show the full moon. Therefore we had the event with all 4 telescopes. We were able to show the moon most of the night. Frank and I used the 8 inch newtonian reflector and showed 4 craters: Tyco, Copernicus, Plato, and Endymion. Some of the night the thin clouds acted as a filter, but when the clouds lessened, we needed to add a moon filter to allow the crater details to be seen, since the moon was so bright. We probably had about 500 people look through our telescope. Frank and I took turns seeing Luminaria night events and staffing the telescope. Kevin saved the night with his awesome moon display. Bruce, Don and Terri had their scopes on the moon, and William showed up to relieve PAS members who needed a break.

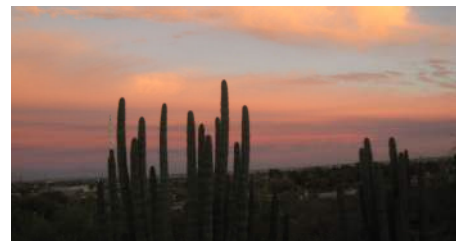
Don writes: When I got there at 4 it looked promising - mostly clear with high thin clouds. While setting up I realized I had forgotten my eyepieces and filters. I have two cases that look similar. One holds my eyepieces and filters and the other holds my solar filter. I had picked up the solar filter by mistake so I borrowed a lens from

Bruce. By the time it got dark enough to align my computer, there were no stars, so I found the moon which was overly bright. I borrowed a dark green filter from Terri, and really liked how the moon looked thru it, so I will be buying one for myself. Most of the time we were there the moon looked good even thru the clouds, but for about an hour from 8 to 9 it was just a green blob and sometimes just a green glow. The clouds also kept most people away...I estimate we had 500 people wander by our scopes.

On **Dec 6**, PAS provided Bruce Wurst (12"), William Finch (10"), Terri Finch (8"), Kevin Witts (8"), and Mike Marron with his Meteorites.

Terri writes: This was a very cold night with a slight breeze, though after about 5:30pm the sky was crystal clear. I showed the Perseus Double Cluster until the scope got to a funny angle, causing people to have trouble getting their necks to bend that way. Then I texted Bruce and asked if I could trade objects with him. I took the Orion Nebula with a nebula filter on it, while Bruce had the Ring Nebula for most of the night until the Orion Nebula came into view. William had the E.T. Cluster all night. There must have been about 2,000 people in attendance. A few were kids. It was a great night to be viewing, even with the super-large and bright full moon.

What we learned is that DBG sells tickets for this event in 2 sets. The 5:30 group of up to 2,000 arrives. Then the 7:30 to 9:30 group arrives, another 2,000 patrons. So, if an event is "Sold Out" it means that there is a possibility of 4,000 patrons roaming around DBG during that night's event. ***



Sunset photo, taken with my Canon 10mpix Camera, from on top of the Hill that the Cart crew calls "Space Mountain" at DBG. Photo



Sam with his scope, Frank, and Bruce gather to chat at the "Top of the Hill" location prior to the Patrons arriving for the evening viewing. They are dressed so professional. Photo by Terri taken Dec 5..



Mike set up at DBG Luminaria. Photo by Terri.



The "Top of the Hill" location where one scope can fit in the alcove. Seen here are William and Kevin. Photo by Terri on Dec 6.



Don with his scope and Kevin with his Moon Display at the Ramada on "Space Mountain." Photo by Terri taken Dec 5..

DBG Luminaria Dec 12 & Dec 13

By Various Attendees

On Dec 12, we had cloudy skies so 2 presenters went down to DBG to keep the Guests entertained. Kevin Witts took his Moon display and Mike Marron had his meteorites. Ofelia Waters attended as helper for bathroom breaks. Mike brought his Meteorites.

Kevin writes: It was a "Presenters Only" night at the DBG as Mike and I set up under completely overcast skies for the Luminaria event. The DBG put up a canopy tent at the top of the hill for us to set up under due to the possibility of rain. I'd estimate that we had about 1000 visitors come by to explore Mike's meteorite collection and my Moon set up. We had some wind, so it was necessary to anchor down the reading materials with large rocks collected from the surrounding area. That turned into a standing joke all night as visitors inquired about the rocks asking if they were moon rocks or meteorites all night.

I set up the large Apollo rocket, but was forced after about 1 hour to disassemble it due to the high winds. Visitors seemed most interested in the discussions regarding exploration of the solar system and some of the interesting features of various moons such as Io, Enceladus, Triton and Europa.

Many were fascinated with Mike's meteorites and stories. I met a few folks from out of town and was able to provide some information regarding Phoenix and Arizona. There were not many children among the visitors this evening - it seems that many families may have stayed home due to the weather.

Indeed, the skies were completely cloud-covered for the entire evening. I continue to hear comments from visitors regarding how much they enjoy the presence of the PAS at this event, even when there are no scopes set up. It seems that there are many budding Astronomers out there. I've even been able to give advice on telescope purchase for the holidays. One final visitor pulled me aside and expressed a desire to purchase a scope for her husband as a wedding gift. She asked for some recommendations and also liked the idea of attending a public star party to try out some different scope designs.

On Dec 13, the Telescope Team consisted of Bruce Wurst with his 12" scope

set up at the Ramada, Howard Moneta and Kevin Witts both with 8" scopes in the Overlook and Eric Steinberg with his 22" scope at the Top of the Hill. The team arrived about 4pm and were able to set up, but then were shortly bombarded by a brief unexpected storm that rained on them.

Kevin writes: I arrived at the DBG around 3:30 and had a few sprinkles on the car windshield. The sky cleared pretty well by the time I was driven to the Overlook area but continued to change all through set up. As soon as the 4 scopes were set, a light rain began to fall. We all hustled to cover the scopes with tarps.

Off in the distance, just beyond camel-back mountain, the storm was passing through with dark clouds, lightning and ultimately, a large rainbow. The temperatures dropped a bit and the sporadic rain fell.

The clouds finally passed and we were able to uncover and calibrate. I was on the Outlook with Howard and I showed the Owl cluster all night. I had approximately 800 visitors to the scope and was able to explain to each about the popular asterism. The skies were clear, but there was a lot of city glow obscuring some of the fainter objects. Around 8:00, I began to notice some fading of the object and found a thick layer of dew had formed on the scope glass. I believe that each of us experienced this and struggled to keep the scopes clear for the rest of the evening.

People were appreciative of the views and many again commented on how cool it was to have telescopes at the event. Susan has been great throughout and came to check on us as the rains fell. She brought water to Mike and I on the previous evening and also always ensures that we are set to go. She is a great host and it's most appreciated. I continue to be pleased by the public's overall response to our presence and feel like people are really enjoying the views.

Eric writes: December 13th was my first DBG event. I arrived just in time after a GPS wild goose chase (embarrassing, since I've been there before!) to face the challenge of getting the 22" scope into the transport cart. A little extra muscle power did the trick and we were off to the setup area under what seemed to be clearing skies. I set up at the top of the hill and was thinking about dinner and how cold it was



Eric and "The Cannon" at DBG Luminaria on Dec 12. Photo Taken by Kevin Witts.



Kevin & Mike's set up at DBG. On Dec 13: Image taken by Howard Moneta



Kevin's Moon Display at DBG Luminaria on



The Telescopes hiding from the freak rain storm. On Dec 13: Image taken by Howard Moneta.

DBG Luminaria Dec 12 & Dec 13

getting when I realized I had left my hat in the car – I needed the exercise anyway, so ran down and back up, ate and sat down to wait.... For the rain to start! Those clouds that were clearing decided to retrograde and dump on us. Thankfully everyone had tarps to cover the scopes, but it sure was wet. Eventually the sky did clear, but the humidity did not. So my first DBG was also the first time I've observed in condensing humidity. Virtually everything was soaked in condensation – mirrors, corrector plates and hardware dewed up, making for a messy, frustrating business. Thankfully, for some reason, the 22" mirrors didn't dew up as much and provided a good, if moist, viewing experience through the night. I

believe I had upwards of 400 viewers, who were almost universally extremely appreciative. That one fact really made the evening worth it. We finished tired and damp (and at least in my case, pretty satisfied with the viewing) and headed home. Once there, even though it was late, I had to pull virtually everything out to dry in the house, hopefully with no damage done.

Bruce writes: Looked at ring nebula until found out Eric was on it. Everyone said I had a nicer view. That don't make sense. Then went to the Orion Nebula for rest of night. Last half hour, so much dew on corrector plate could hardly see the nebula.

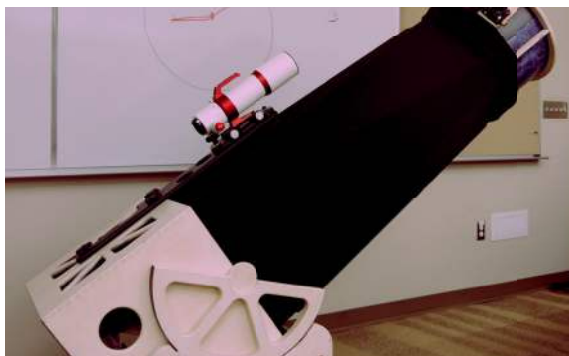


A beautiful Rainbow after a brief, freak storm drops a bucket of rain on the DBG Luminaria Telescope Team on Dec 13. Image taken by Howard Moneta.

January PAS Meeting Review

(Continued from page 1)

on the "Telekit." Roger shared with us an amazing story of the history, the meetings with various amateur astronomers and the making and building of the "Telekit" 16" telescope he brought for his presentation. There are 321 pieces to this kit. Many photos were taken and will be posted to the PAS Photo Gallery. Special thanks to Roger for a spectacular, interesting presentation! It was a great meeting! Bruce won the raffle. See you at the next meeting!



Antenna's Nov 23

By Howard Moneta

Eric Steinberg, Sam and Frank Insana, and I had a great time at Antennas. Everyone saw things that they had never seen before. For me, the first time observations included the Andromeda Galaxy with both companion galaxies all in the same view and then later seeing M81 and M82 together in one view. We were all floored by the beautiful Sculptor galaxy. It is amazing. The Orion Nebula had more detail than I had ever seen before. In dark conditions, the whole thing doesn't even fit in a 30mm eyepiece. I usually pick a higher magnification and focus on the Trapezium as the object of interest but in this case, with such a clear and dark sky, the nebula really stole the show. Jupiter showed up late but was very prominent in the sky. We could see three moons through binoculars and telescopes though Io was not visible at the times that I looked.

It was a nearly perfect night. We had debated the trip because the weather sites

rightly predicted wind which we had quite a bit of early on, but it departed and left nearly ideal conditions the rest of the evening. What more can I say, great experiences exploring the universe with friends are a treasure!

Sam writes: The Antennas trip was awesome as usual. The skies were clear and there seemed to be thousands of bright tiny lights shining down on us, besides the huge glow of the Milky Way.

7 of the 8 weather forecasters said that the 10-15 mile per hour winds would die down about an hour after dark. Eric, Howard, Frank and Sam took the chance on driving 100 miles each way, and it paid off. After about an hour of fighting the 15 mph wind, trying to align our telescopes, the wind died down to about 5 mph so that we could do some fine observing. Frank used his small refractor to see a sliver of the moon, the pleiades, and the orion nebula. He also hiked several miles of desert and

surrounding hills prior to observing. Eric used his 22 inch scope to wow all of us with his great views of even the smallest distant objects. Howard was discovering several new objects and showed a lot of excitement. Sam observed dozens of objects from 7 pm until 2 am and then had to sleep a few hours before resuming at 5 am for one last hour. I observed 10 new objects in my 8 inch scope including the Saturn Nebula, the Helix Nebula, several open clusters, a new globular cluster and 2 new galaxies. Neptune looked even bluer than normal against the dark sky. There was some turbulence in the air so that looking at Jupiter at 1 am wasn't impressive. But at 6 am the skies were steady and the red equatorial stripes were very striking. During the night I also observed many old favorites like Andromeda Galaxy and Orion Nebula to get a fantastic view not seen under the glow of the Valley. There were several meteors every hour, and at 6 am, I saw a very large, bright

(Continued on page 10)



Minor mergers have massive consequences for black holes

By Dr. Ethan Siegel

When you think of our sun, the nearest star to our world, you think of an isolated entity, with more than four light years separating it from its next nearest neighbor. But it wasn't always so: billions of years ago, when our sun was first created, it very likely formed in concert with thousands of other stars, when a giant molecular cloud containing perhaps a million times the mass of our solar system collapsed. While the vast majority of stars that the universe forms some ninety-five percent—are the mass of our sun or smaller, a rare but significant fraction are ultra-massive, containing tens or even hundreds of times the mass our star contains. When these stars run out of fuel in their cores, they explode in a fantastic Type II supernova, where the star's core collapses. In the most massive cases, this forms a black hole.

Over time, many generations of stars—and hence, many black holes—form, with the majority eventually migrating towards the centers of their host galaxies and merg-

ing together. Our own galaxy, the Milky Way, houses a supermassive black hole that weighs in at about four million solar masses, while our big sister, Andromeda, has one nearly twenty times as massive. But even relatively isolated galaxies didn't simply form from the monolithic collapse of an isolated clump of matter, but by hierarchical mergers of smaller galaxies over tremendous timescales. If galaxies with large amounts of stars all have black holes at their centers, then we should be able to see some fraction of Milky Way-sized galaxies with not just one, but *multiple* supermassive black holes at their center!

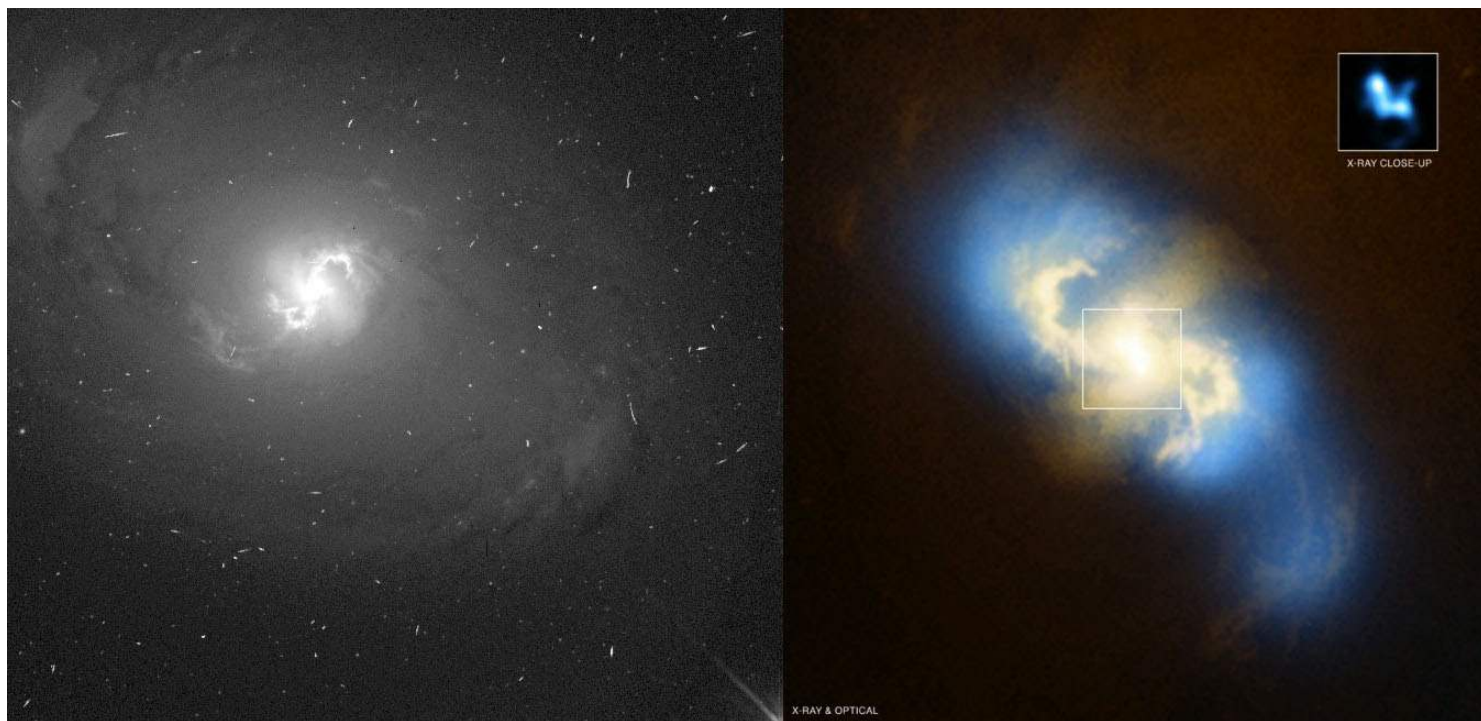
It was only in the early 2000s that NASA's Chandra X-ray Observatory was able to find the first binary supermassive black hole in a galaxy, and that was in an ultra-luminous galaxy with a double core. Many other examples were discovered since, but for a decade they were all in ultra-massive, active galaxies. That all changed in 2011, with the discovery of two

active, massive black holes at the center of the regular spiral galaxy NGC 3393, a galaxy that must have undergone only minor mergers no less than a billion years ago, where the black hole pair is separated by only 490 light years! It's only in the cores of active, X-ray emitting galaxies that we can detect binary black holes like this. Examples like NGC 3393 and IC 4970 are not only confirming our picture of galaxy growth and formation, but are teaching us that supermassive relics from ancient, minor mergers might persist as standalone entities for longer than we ever thought!

Check out some cool images and artist reconstructions of black holes from Chandra:

<http://chandra.harvard.edu/photo/category/blackholes.html>

Kids can learn all about Black Holes from this cool animation at NASA's Space Place: <http://spaceplace.nasa.gov/blackholes>.



Images credit: NGC 3393 in the optical (L) by M. Malkan (UCLA), HST, NASA (L); NGC 3393 in the X-ray and optical (R), composite by NASA / CXC / SAO / G. Fabbiano et al. (X-ray) and NASA/STScI (optical).

PAS Music Jam Jan 3

By Terri, Event Coordinator

The 2015 PAS Music Jam was really good with some great musicians there. The jam started about 7pm and continued until about 10pm. Ed Wurst played the accordion. Bruce Wurst played the fiddle/violin. Terri Finch played the mandolin, guitar, flute and keyboard. Don Boyd played the keyboard and sang some songs. Eric Steinberg played the bass (It's all about that bass) and the recorder (several). Sam Insana played the keyboard, bass and trumpet. And we had one really awesome rhythm section provided by Kevin Witts on various percussion instruments. Ora Kurland assisted with maracas. We did not record this session.

In attendance were Eric and Ora, Don, Ed and Bette Wurst, Bruce, Mike Marron (host of the event), Sam Insana, Rodney Fong, William and Terri, Bob Senzer, Kevin Witts, Kevin Harcey and Howard Moneta.

The potluck was at 5:30. Many thanks to all who contributed to the potluck. There was pizza brought by Ed and Terri (shared in expenses). Don brought a delicious pasta dish and sparkling cider. Ora's brownies were a hit. There were powdered donuts, some cookies, Church's Chicken brought by Sam, another chicken brought by Kevin Harcey, meatballs from Eric, some salami rolls brought by Kevin Witts and a variety of other items. Dinner was delicious!

After dinner, we gathered in Mike's living room, set up instruments and played music for 3 hours beginning about 7pm. Many great songs were enjoyed: Five Foot Two, Over the Rainbow (nice duet by Eric on recorder and Terri on flute), Tennessee Waltz which had a great soft duet between Bruce on fiddle and Terri on mandolin, some wonderful trumpet solos by Sam, some great violin tunes and fiddle tunes by Bruce, Hava Nagila with Ed on the accordion, and Wipe Out with Kevin on drums. It was a very musical, fun evening for everyone. We also had some vocals by Don and Ora. There was rhythm by Terri on the guitar, and Eric played some awesome bass guitar. We were appreciated by a great audience who mentioned how wonderful the music was (even with our mistakes!). If you missed this PAS Music Jam, plan to attend the next one in January 2016.

We look forward to next year's music jam and would love to have your attendance. Photos for this event will be posted to the PAS Photo Gallery, soon.



(L to R) Bette and Ora with Maracas and Kevin on Drums, photo by Terri.



(L to R) Terri on Flute, Eric on Recorder & Sam on Bass Guitar at the PAS Music Jam on Jan 3. Photo taken by William Finch.



(L to R) Bruce on Fiddle, Bette headless due to the placement of the mbol, Ora beside Bette, and Kevin on Drums at the PAS Music Jam on Jan 3. Photo taken by William Finch.



(L to R) Bette and Ora with Maracas at the PAS Music Jam Jan 3. Photo by Terri.



Sam on Trumpet at the PAS Jam on Jan 3. Photo by Terri.



(L to R) Don on Keyboard, Ed on Accordion, Bruce on Fiddle at the Jam on Jan 3, photo taken by Terri.

Cocopah Middle School Star Party Nov 21

By Various Attendees

Terri writes: In attendance from PAS were: William Finch with 10" scope, Terri Finch with 8", Don Boyd with 8", Roger Anzini with 16", Bruce Wurst with 12", Earl DeLong with 10", Sam Insana with 8", Frank Insana with small refractor, Mike Marron with Meteorites, Rodney Fong as a helper, and Kevin Witts with an 8". Also attending from Saguaro Astronomy Club was Bob Christ along with 2 other scopes from other sources for a total of 12 scopes.

The evening was scary, starting out with loading the scopes under threatening black storm clouds. We were sure we weren't going to see anything, but the weather sites said it would clear up about 7:30pm.

When William and I got to the school at 4pm, most of the telescope team members were already there setting up. The sky was still looking very bad, but since the rest of the scopes were setting up, we did too. At 5pm, we went to eat: sub sandwiches, chips, drink, some candy and fruit. We grabbed our dinner and came back to watch the scopes while the other half of the team went to get food. The food was from Witch 'Wich sandwich shop. Yummy.

Then the event began, though I believe people started visiting our scopes before 6pm. The clouds cleared about around the same time and the sky stayed clear through the whole event. After that it was a nonstop flow of people: adults, kids and teachers. The kids were asking if they could have their pages stamped - I had the PAS stamp with me, so I did that, and gave out hand-outs. Kevin had printed up some astronomy "nose pinching" game pages which I gave out, along with November star charts with PAS info on the back. I didn't have any time to do Q & A - we were that busy. I'd say we saw a minimum of 800 people that night. Maybe more.

Even with all the scopes that attended, the evening was busy enough that we were worn out by the end of the evening. The temperatures were a bit brisk and several members grabbed jackets and gloves. I be-

lieve my phone said it was about 50 degrees by the time we packed up to depart. Brrrrr.

Many thanks to Tracey Dodrill for inviting us to this fun event. Along with the telescopes, Tracey had set up about 50 other activities for the attendees. This was an amazing, well planned event. William and I showed these objects during the night: E.T. Cluster, Ring Nebula, Alberio, Mars, and M103, which William stayed on for most of the night. Many thanks to my fantastic telescope team.

Some thoughts about set up for next year, if we are invited back: I would say put the cars on the outside area of the observing parking lot, closer to the building and put the scopes closer together, maybe along the sidewalk area so there is less repeat of objects and we can hear what the others are showing. We did have some public saying "Oh, I saw that object in another scope." Mike said that several people told him that he was the best part of the whole event for the night.

Earl writes: The PAS attended the Cocopah STEM event on Friday November 21, 2014. STEM stands for Science, Technology, Engineering and Math and is designed to inform and excite students about these careers. It was the largest event I have attended at a Middle School. There were two pages of activities for the students and parents. In addition to our telescopes, there were reptiles, minerals, rocks, rocketry, wind tunnel demonstrations, robotics, meteorites, an insect collection and a planetarium.

I started by showing 16 Cygni a nice double star system with the twin stars similar in size and color to our sun. Next I moved to M27, the dumbbell nebula. It was visible, but faint from this location. M2, a globular star cluster in Aquarius showed up well as did M15, another globular

star cluster off the nose of Pegasus. To end the evening, I showed gamma Andromeda (Almach) a nice double star system that appears to have differing colors due to their magnitude difference and moved to the double cluster NGC 884 and NGC 869.

Overall, it was a pleasant although cool evening. The only change I would make if we are invited back, would be to have all the telescopes set up on one side of the parking lot. I did not have many people stop and look through my telescope as they probably did not know I was set up between two vehicles.

Roger writes: This is funny. William, Don and I were looking at the 7 sisters in my little 81mm scope. Crystal clear about maybe 35 or 40 stars. William says to me "what brand is this scope" I said gosh I'm having a memory lapse.....it's a swan....it's the guys first name that owns the company??? Well please tell William.....it's a.....WILLIAM !!! Boy it's fun to get old ! Thanks for a great time last night.

Rodney writes: Cocopah Middle School's "Evening Under the Stars" Event on Nov 21st was a very busy and fun time. I spent the entire time assisting at Mike's Meteorite display and as always, his collection of space rocks was a "Crowd Pleaser" with many "Wow" reactions from the students & parents alike. Many returned and commented they enjoyed his presentation.



William setting up for the event at Cocopah School. Photo by Terri.

Antenna's Nov 23

(Continued from page 7)

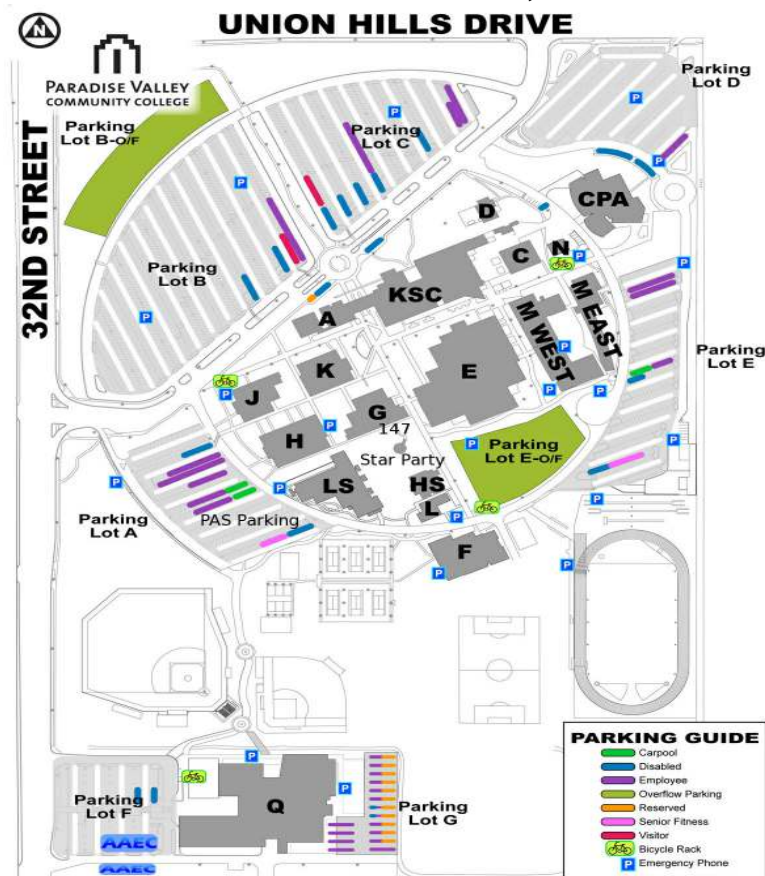
yellow fireball traveling slowly over 1/3 rd of the sky. Mike would have been running after it if he had been there. It was a cold night but 4 layers of clothing plus gloves and a Russian fur hat made it comfortable.

At 6:30 am, Frank and Sam left the area while Eric and Howard were still sleeping in their vehicles. We had a fine breakfast buffet at a truck stop at exit 103. Driving into Phoenix we noticed a huge cloud of

smoke covering the west valley like a fog. It turned out to be a mulch fire from a farm near Luke Air Force Base.

Map of PVCC Main Location

18401 N. 32nd Street | Phoenix, AZ 85032



The Stellar Spectral Types

By Leah Sapir

At the end of the 19th century, Prof Edward Pickering and his staff at the Harvard College Observatory were busy cataloging and classifying the stars according to their spectra. The first classification scheme, designed by Italian astronomer and spectroscopist Father Angelo Secchi in 1866, divided the spectra into four groups, numbered I through IV, based on the strength of various spectral lines. Then in 1890, Williamina Fleming, a member of Prof Pickering's staff, divided Secchi's four categories into subgroups, identified by the letters A through Q. Antonia Maury and Annie Jump Cannon, also members of Prof Pickering's staff, further refined the system. Antonia Maury moved type B ahead of A, and Annie Jump Cannon moved type O to the very beginning, and combined groups that were similar, leaving just: O B A F G K and M. A common mnemonic for these letters is "Oh Be A Fine Girl, Kiss Me!" But for those who prefer other options, a large variety of mnemonics is available – such as "Only Boys Accepting Feminism Get Kissed Meaningfully" or "Only Boring Astronomers Find Gratification Knowing Mnemonics!" My favorite, though, is: "Oven-Baked Apples From Grandma's Kitchen - Mmmm!"

More options are available in this list:
<http://www.star.ucl.ac.uk/~pac/obafgkmrns.html>

February 2015

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5 <i>PAS Meeting</i>	6 <i>Jupiter at Opposition</i>	7
8 <i>Free Telescope Workshop</i>	9	10	11 <i>CTCA (Private)</i>	12 <i>MOM's - Business Meeting</i>	13	14
15 <i>Star Party (Private)</i>	16	17	18	19 <i>Public Star Party at BMC</i>	20 <i>2 Schools star parties (Private)</i>	21
22 <i>Conjunction of Venus & Mars</i>	23	24 <i>School Star Party (Private)</i>	25 <i>CTCA Back up</i>	26 <i>Free Telescope Workshop</i>	27	28

Don Boyd
PAStimes Editor
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Phoenix AZ 85029

To:

2015 PAS GUEST SPEAKER LINE-UP

By Terri, Event Coordinator, Events@pasaz.org

Do you have an idea for a Guest Speaker? Email me the details.

Here's the scheduled Guest Speakers at PAS:

<http://www.pasaz.org/index.php?pageid=meetings>

Mar 5: Alex Vrenios "You're So Far Away"

Apr 2: TBA

May 7: Earl DeLong "Our Journey to Pluto: Nasa's New Horizons Mission"

Follow PAS on:

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Facebook - <https://www.facebook.com/PhoenixAstronomicalSociety>

Meetup.com - <http://www.meetup.com/Phoenix-Astronomical-Society/>

What's Up For February?

By Rod Sutter, PAS Past President

Planets

Name	Date	Rise	Set
Mercury	02-15-15	05:50	16:15
Venus	02-15-15	08:32	20:17
Mars	02-15-15	08:38	12:332
Jupiter	02-15-15	17:13	06:52
Saturn	02-15-15	01:48	12:08
Uranus	02-15-15	09:23	21:52
Neptune	02-15-15	07:45	18:58
Pluto	21-15-15	04:44	02:55

All Times Arizona Time

February 15 2015

Sunrise: 07:12

Sunset: 18:13



Full: February 3



Q3: February 11



New: February 18



Q1: February 25

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