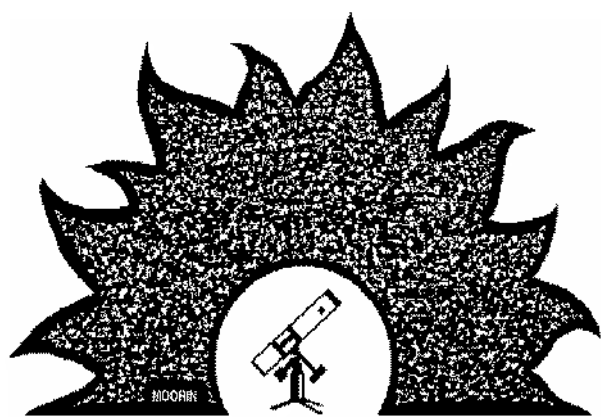




PAStimes

Phoenix Astronomical Society

www.pasaz.org

September 2015

Volume 67 Issue 1

PHOENIX ASTRONOMICAL SOCIETY — ESTABLISHED 1948

Welcome back for another Year of PAS!!!

Meet in Room LS-204

By Terri, Event Coordinator

At our September 2015 PAS meeting, we will be having several small presentations by various attendees. Please bring a snack to share - bottled water will be provided by PAS through the snack fund. To continue to have bottled water provided to you during these meetings, we request that you donate a minimal amount at each meeting (even coins in your pocket) towards the next meeting's "water supply" and snacks.

We will open the meeting with the "Swapping of PAS Position Badges" and Congratulations to the new PAS Officers.

Here is a summary of what you might enjoy at this meeting (may not be in this order):

Alex Vrenios & Sam Insana (30 mins): **"Solar Eclipse of 2017"** A solar eclipse, not to be confused with a lunar eclipse, is a rare and spectacular event. As the Moon covers the Sun, the solar corona appears around the pair like a flaring halo. Tiny,

brilliant flashes of sunlight escape between lunar mountain peaks and odd, wavy shadows ripple across the ground.

Of course, when there is a solar eclipse it's often only visible along a path through some remote part of Australia, or in the Arctic Ocean, and tagging along with the Astronomy or Sky & Telescope magazine tour group just isn't within the average amateur astronomer's budget.

On August 21, 2017 it will be different, perhaps a once in a lifetime opportunity. This solar eclipse will be visible along a path that starts in Oregon and continues south by southeast through Idaho, Wyoming, Missouri, Kentucky, Tennessee and South Carolina. We've identified three cities along that path that are easy drives from Phoenix and have a good chance of clear weather during the event.

A few of us started looking at the weather history on August 21st at that time

of day of the event to see if it might be clear there. We also started looking at the surrounding roads and highways for a quick change of venue, in case a rogue storm threatens to ruin our afternoon. We will present our findings during the September 2015 meeting.

Sam adds: We will try to address the path of totality, the weather analysis, favorable towns to see the eclipse and escape routes should cloudy weather come in 24 hours before totality.

Pete Turner (40 Mins): **"Black Holes:** Everything you thought you knew about them is wrong (well, almost everything)!"

Sam Insana (10 mins): **"Flagstaff Festival of Science"** an update on what events are happening this year.

Alex Vrenios (20 mins): **"Beyond Hubble"** This presentation parallels an article I wrote that was placed in the September issue of PAStimes.§

PAS Meeting May 7

By Terri, Event Coordinator

This was a fine meeting. Many thanks to the wonderful trip we took with Earl DeLong as our pilot!

The meeting began with a few announcements: Alex Vrenios talked about the Aug 21 total eclipse of 2017 and how one can find information about it in Astronomy Magazine. Don Boyd talked about the status of CTCA and the plans for the next year and Mike Marron reminded us about the May 14 Celebration of Life Party being held at PVCC in memory of Jerry Belcher

and Bob Senzer. President Bruce Wurst then welcomed everyone and had the new attendees introduce themselves. Tina has a scope and found us through MeetUp - she will join us at Bookmans for the next telescope workshop. Wade says he is like minded. A new Kevin was also a newbie to our meeting. Next, Kevin Witts passed out a "size of the telescope" sheet and talked about Benchmark School.

We then turned to our yearly officer elections, starting with the Members at

Large. Due to Dave Hellman not being able to attend most evening events, we elected a new Member at Large. Congrats to Alex Vrenios who will serve a two year term as the new MAL. Jenny Weitz is still a Member at Large and has one more year to serve. Rodney Fong was voted in and accepted continuation as Host of PAS. Rodney is an awesome Host. There was a discussion as to whether we could have a Hostess position, but it was not resolved on this night. Next, Don Boyd's position came up for election as the Editor of the PAStimes

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September Upcoming Events

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

More events may be added to the list, so check the website for updates at <http://www.pasaz.org/forums/calendar.php>.

This month we have several NON PAS events listed on our calendar. Feel free to attend them and RSVP where requested.

Sept 1: Neptune at Opposition

Sept 3: PAS Meeting in LS-204. Come enjoy a wonderful set of presentations done by PAS Members, at this meeting. Bring a snack to share. Bottled water provided by PAS Snack Fund and any donations you can make to the snack fund are very appreciated for next meeting's water supply. Everyone Welcome. More details at this link: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1631&day=2015-9-3&c=1> Also has Meeting Agenda.

Sept 9: CTCA (Private) Star Party

Sept 10: PAS Meeting of the Minds in LS-205. This meeting is open to the public. We have a super line up of Guest Speakers for this evening doing mini presentations. This meeting is a Party! Bring a snack to share. Bottled water provided by PAS Snack Fund and any donations you can make to the snack fund are very appreciated for next meeting's water supply. Everyone Welcome. More details at this link: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1526&day=2015-9-10&c=1> Also has Meeting Agenda.

Sept 17: 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 Events@pasaz.org. 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. More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1394&day=2015-9-17&c=1>

Sept 18: School Star Party (Private)

Sept 20: Free Telescope Workshop at Bookmans, 19th Ave and Northern in Phoenix - 3:30pm to 5:30pm. RSVP is required with Terri Events@pasaz.org. 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. More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1386&day=2015-9-20&c=1>

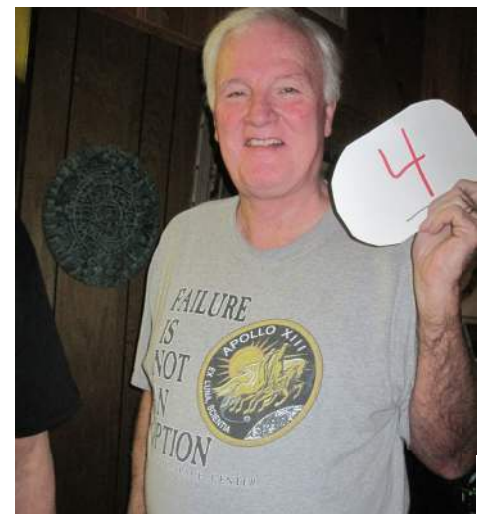
Sept 24: PVCC Free Telescope Workshop at PVCC Main campus, 32nd Street and Union Hills Rd - 7pm to 10pm with Public Star Party. RSVP is required with Terri Events@pasaz.org. Seating is limited. When you RSVP, please leave your first name, and the make and model of your telescope. Bring your telescope 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. More details:

<http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1406&day=2015-9-24&c=1>

Sept 27: School Star Party (Private)

Sept 27: Total Lunar Eclipse Party at Coyote Basin Park. Open to the public, bring the whole family. RSVP is requested with Terri Events@pasaz.org. Should we need to cancel, due to weather, an email will be sent to you by 3pm the day of this event. This event is Weather Permitting, and Free. Come look through our telescopes at the Eclipsing Moon. More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1778&day=2015-9-27&c=1>. Event time is 6:15 to 8:30pm. If you can't attend this event, watch the Moon from your backyard! ***



Peter Turner will be Presenting "Black Holes" at the Sept 3 Meeting.

Presidential Corner

By Sam Insana, PAS President

Each month I would like to examine some issues of importance to our club. In this first Presidential Corner I want to explore 1) What PAS has to offer members and the public, 2) The upcoming Flagstaff Festival of Science.

1) Over the 30 years I have been a member, I have seen our club grow in size and activities. We have scientific lectures at our monthly meetings that explore every aspect of astronomy. Our public outreach programs allow many of our members to bring their telescopes to people of all ages so that they can enjoy the wonders of the night sky. We do this at schools, parks, Mike's place in the Carefree desert, and other venues. Each of our members can experience the satisfaction of hearing the public say "Wow!" when they see the planets, galaxies, globular clusters, nebulae, colorful double stars, comets, sunspots, solar flares, and other heavenly delights.

Some of our members go to very dark sites to spend the entire night observing deep space objects not seen in the glow of the Valley.

We have workshops where members and the public can ask questions about their telescopes and there is literature to be handed out that teach both about what is up in the night sky, what binoculars have to offer and what are the differences between various types of telescopes.

We have Night Sky Training Sessions where members can bring their telescopes and learn some important tips on night sky viewing.

The PAS socials provide our members with good food, games, and most importantly great conversation and fellowship.

Our club is also beginning to offer the ability to engage in scientific research. At the Perseids Meteor Shower on August 12, 2015, we had about 15 people at Mike's place in Carefree, seeing meteors of various brightness and color. One PAS member wrote up detailed findings and submitted them to the International Meteor Organization for analysis. Other members used an app on their smartphones to send in the count to a university. We hope to engage in other scientific projects in the

near future. PAS has a lot to offer its members and the public.

2) The Annual Flagstaff Festival of Science will be from Friday Sept 18 through Sunday Sept 27. I have been to several of the 25 past festivals and I encourage PAS members to go up for a weekend or both weekends to hear great lectures, tour observatories, visit Meteor Crater, go on nature hikes and much more. There will be over 80 events in the 10 days, and they are all free. On Friday night, Sept 18, at 7 pm in NAU's Audrey Auditorium, they will have a presentation by Alan Stern PhD the head of the New Horizons Mission. He will have the photos and data on Pluto and other objects explored. I also recommend the Science in the Park event where dozens of booths are set up with literature and demonstrations from all aspects of science. They even set up solar telescopes for viewing. Finally, there will also be a star party in Buffalo Park where dozens of scopes are available for viewing. Check the Science Festival website for detailed information: www.scifest.org

Meeting of the Minds July 11

By Terri, Event Manager

Please note, the next Meeting of the Minds is on September 10 at PVCC.

PAS called a Special Meeting of the Minds (MOM's) at Mike's home in Carefree to vote on two issues. Prior to the MOM's, we had a wonderful potluck and afterward a fantastic members-only star party.

In attendance, on this super clear observing night were: William and Terri Finch, Storm Sallas, Howard Moneta, Rodney Fong, Sam Insana, Don Boyd, Pete Turner, Kevin Witts, Dewell and Wendy Howell, Paul Facuna, Alex and Diane Vrenios, Joe Acquavella, Eric Steinberg and Ora Kurland and of course the host of the event, Mike Marron.

Many thanks to everyone who brought food to share. Dinner started about 5:30 and ended a little before 7pm.

At 6:45pm, We called the MOM's to order. The meeting started with discussion of a few upcoming events including the Flagstaff Festival of Science, the Flagstaff Star Party and the Solar Eclipse of 2017,

Alex and Sam talked about this topic and where where we should go to see it, perhaps Wyoming or Nebraska for totality. We also discussed the Conflict of Interest statement.

The voting portion of this meeting was to 1) change the PAS by-laws to show that we have a Secretary position, and then to elect a PAS member into the Secretary position. The vote was positive on both, with Kevin Witts taking the job. Congrats Kevin! While at this meeting, Kevin took the minutes, which will be available for review to all PAS Members (Members only) in the private forums of our site at this link: <http://www.pasaz.org/forums/showthread.php?t=964>. You can read them prior to the next MOM's, where we will approve them. This makes PAS a little more official as a club.

We then had a brief talk about changing the webpage to reflect the change in officers, update the People of PAS page and others. Watch for changes on the site.

If you are a current PAS member and you want to be included send a photo and a brief paragraph about yourself and how you got into astronomy.

We also discussed the upcoming Luminaria events at DBG, but just in brief, as everyone was wanting to get outside and view on such a super clear night!

Outside, we had Eric with his 22", Howard with his 14", Kevin, Dewell with the 12", Pete with his 9.25" and Sam with his 8" scope. It was a wonderful evening. There was a slight breeze which kept the hotness of the summer air decent. We saw some great objects! Many thanks to everyone who brought a scope and shared the views. I was at every scope I could walk up to, checking the views. The star party was a great ending to a fantastic evening! We were really lucky this late in the monsoon season to have such a beautiful evening. The next event we had scheduled, on July 18 had to be canceled due to the monsoons. This was our summer star party! See you at the next event!§

PAS Meeting May 7

Continued from page 1

Newsletter. Don was voted to stay as Editor which he accepted. We then discussed the Treasurer position. Mike Marron stepped down and gave the position to Eric Steinberg. Congratulations to Eric, the new Treasurer of PAS! I don't know that he knows what he has gotten himself into :) We then addressed the President's position. Bruce Wurst was voted out and Sam Insana took over as PAS President. In his acceptance speech, Sam told everyone he was going to write a monthly article for the newsletter called the President's Corner. Congrats to Sam! Next was the Vice President's job which we divided into two positions, Vice President and Events Coordinator. Terri Finch stepped down as Vice President and Howard Moneta was elected in her place. Congratulations to Howard! Terri will continue to be the Events Coordinator for the next year. The consensus was that it would take 3 people to fill the job she does and no one else really wanted it. Sam suggested and it was agreed that Event Coordinator would become a manager position. We then dis-

cussed the Librarian position, still held by Rod Sutter and talked about a Properties Manager for the club, which at the moment is Bruce Wurst. The election took until 8:40pm due to all the discussions. Next year the elections will take place at a Meeting of the Minds to save time for the guest speaker, sometime in May 2016.

At that point we turned the night over to a really interesting Guest Speaker: PAS Member Earl DeLong who invited us to take a trip on his "space ship". We each got a boarding pass, which was an awesome idea. Earl shared with us info about the Greek underworld and how it related to Pluto and its mythology, along with the approach of New Horizons to Pluto on July 14, 2015. This was a very informative, fun meeting with a really interactive group.

The PAS Raffle was won by Diane Vrenios and the Boarding Passes were used to give away 2 prize books: "Pluto" by Barry Jones, won by Alex Vrenios and "Space Probes" won by Pete Turner.

A friend of Jerry Belcher, Greg Coons

(co worker), brought a collection of books to the meeting to donate to PAS. My daughter Amanda "Storm" Sallas wrote neatly in each book and stamped it with the PAS stamp, saying it was donated by Jerry Belcher with today's date, after which we lent them out for members to borrow.

Welcome new PAS member, Tina! We hope to see you at many of our events!



Earl DeLong "Our Journey to Pluto."
Photo by Terri

December 2 2015 PAS Meeting

By Terri, Event Coordinator

Please note the change in Day of the week for the December PAS Meeting. We have been approved to hold the December PAS Meeting at PVCC in Room LS-201 on

Wednesday Dec 2. Make a note of this as a reminder: Our guest Speaker will be terrific so you don't want to miss it. A small article like this one will also be in the December

Newsletter to remind you to attend on a Wednesday rather than the usual Thursday meeting date. See you there!

PAS Meeting of the Minds Sept 10 2015

Meet in Room LS-205

By Terri, Event Coordinator Events@pasaz.org

Plan to attend this awesome meeting! This meeting is being held to enjoy some mini presentations by PAS Members. It is open to the public and anyone of any age may attend. We will not be discussing PAS Business at this particular meeting, but will retain that for a future meeting.

This meeting is a Party. Bring a snack to share. Bottled water will be provided by the PAS Snack Fund, so please donate to next meeting's water supply. If you don't wish to have bottled water, bring your own drink in a closeable container.

Meeting room opens 6:30 and this meeting begins 7pm.

Here is the meeting agenda (although it may not be presented in this order):

Kevin Witts (45 mins): "**Visiting the Rocket Garden**" Take a close-up, hands-on and personal look at the machines that have lifted man and his instruments into space. Learn about the evolution of space-faring vehicles and find out what's next as we journey deeper into space.

Earl DeLong (? mins): "**Selecting the Proper Telescope Eyepiece**"

Sam Insana (15 mins): "**Scientific astronomy research projects**" Professional astronomers rely on amateur astronomers for much needed help in collecting data. Interested PAS members could help on many interesting projects from meteor counting to occultation studies to variable star analyses and much more.



May 17 by Kevin Witts

Astro Tech: Beyond Hubble

by Alex Vrenios, PhD

For over two decades the Hubble Space Telescope has provided us with a dazzling array of stellar images, images that in the hands of scientists, helped unlock the secrets of the Universe. Sadly, with the demise of NASA's space shuttle program, Hubble's long-term maintenance contract is coming to an end. One day, about ten years from now, this magnificent instrument will go the way of all orbiting spacecraft: it will descend slowly until it finally burns up in Earth's atmosphere.

That will be a sad day indeed. There is talk of alternatives, but the sentiment at NASA and in Washington DC seems to be to just let it go.

There may be another space telescope. The James Webb Space Telescope (JWST) is often referred to as the successor to Hubble, but it has issues. It began construction with a budget of \$1.6 billion and a projected launch date of 2011. The US House of Representatives terminated its funding when spending reached \$3 billion, but it was estimated to be only 75% complete. Funding was restored in some compromise legislation with the US Senate, with spending capped at \$8 billion and a launch date scheduled in 2018. As of December 2014, it was on schedule and within budget, but at risk of delays.

The JWST is infrared-optimized in order to study the atmospheres of exoplanets discovered by TESS, the Transiting Exoplanet Survey Satellite, to be launched in 2017. An even more ambitious program called WFIRST/AFTA (Wide Field Infrared Survey Telescope/Astrophysics Focused Telescope Assets) should launch in 2024. It will continue to hunt for "biosignatures," among its other objectives. These three space telescopes aim to discover how likely alien life may be in our galaxy. They are not replacements for Hubble so much as the start of a next-step program in space exploration.

There may be a new, more sophisticated space shuttle in the works. A new, smaller model, called the X-37B, is undergoing classified testing at Cape Canaveral Air Force Station in Florida. While not much is known about this new program, a government spokesman has said they are "testing vehicle capabilities and proving the utility and cost-effectiveness of a reusable

spacecraft." The new shuttle will not carry people, but it will probably be used to carry satellites up to orbiting altitudes.

Private companies may take the reins and potentially bring maintenance people to and from the Hubble space telescope. Government funding of commercial space transportation services, however, seems to be aimed more toward shuttling people and cargo to and from the International Space Station.

Rocketplane Kistler, Inc. is one such company. It came out of bankruptcy in 2011 with a new name (Kistler Space Systems) and new people, but they say they will continue to use a "well-developed design intended to provide orbital launch services to the Space Station and for satellite launch. We are in a fund raising mode for a while before we resume construction on the K1."

SpaceX is yet another, run by the visionary, Elon Musk. It is successfully testing its Falcon 9, a 2-stage rocket designed to carry humans, satellites and its drone supply rocket named Dragon. In 2012 Falcon 9 successfully delivered Dragon to a correct orbit to rendezvous with the Space Station.

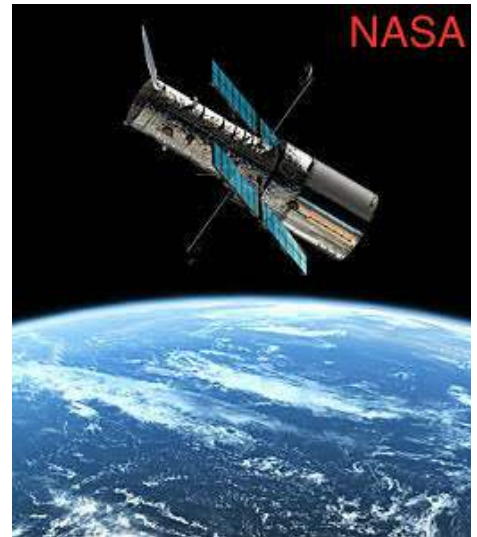
Finally, a new ground-based telescope is being built that may take up the slack left behind by Hubble and then some. The Giant Magellan Telescope (GMT) is being built at the Las Campanas Observatory in Chile and should be operational in 2021.

The term "giant" is aptly chosen in this case. There are six off-axis 8.4 meter (27 foot) mirrors surrounding a central 8.4 meter mirror, forming a total parabolic, optical surface of 24.5 meters, or 80 feet in diameter. The resolving power is expected to be ten times greater than the Hubble, despite its Earth base. Las Campanas, in Chile, is at a very high altitude where it is extremely dry, so there is not expected to be much atmospheric interference.

No one can accurately predict the future, but it looks like the Hubble will be but a memory in another decade. Private enterprise will be contracted to carry cargo and people to and from orbiting spacecraft like the ISS, and ground-based telescopes will once again be the instrument of choice for astronomical research.



Giant Magellan Telescope (GMT)



Hubble Space Telescope (HST)



The James Webb Space Telescope (JWST)



Render showing the size of the array; person on left for scale

Giant Magellan Telescope organization



Experimental Shuttle Spacecraft X-37B

Solar Eclipse Plan - 2017

By Sam Insana and Alex Vrenios

A total solar eclipse is a spectacular event. The solar corona flares up around the rim of the Moon while brilliant flashes of sunlight escape from between lunar mountain peaks. Weird, wavy shadows ripple across the ground and everything around you is completely still, except of course for the oohs and ahs from your fellow observers. Have you ever seen one in person?

No? Well, neither have I, actually. That's because it's a rare event, and when one does occur, the only place you can view it is usually in some remote part of the world or out in the middle of an ocean. But that's all going to change.

On August 21, 2017 there will be a solar eclipse visible from the North American continent. In fact, the path of totality (the line along the surface of the Earth from which totality can be experienced) starts in the northwestern United States, in Oregon, and arcs gently southward through Idaho, Wyoming, Nebraska, Missouri, Illinois, Kentucky, Tennessee and South Carolina. The cities along the western half of that path are almost equidistant from Phoenix, about a 1000 miles away.

That's a reasonable distance to travel for such a wonderful experience. So the bad news is the good news: we've got lots of viewing sites from which to choose!

Will we go as a club or as individuals? That remains to be seen. If enough members are interested in making a financial commitment, we could rent a tour bus and arrange good rates for an overnight stay along the way.

The goal is to find a place along the path of totality that will offer clear skies at the time of totality. We believe that the location with the clearest skies on the date and time of totality over the last twelve years would be the most likely to have clear skies at that time on August 21, 2017. This may not be a completely reliable approach but it's the best we could come up with, so we went to work.

We started with a map of the path of totality created by Xavier M. Jubier on his website, <http://xjubier.free.fr/>. We used his map to choose eleven cities that provided a reasonable drive from Phoenix.

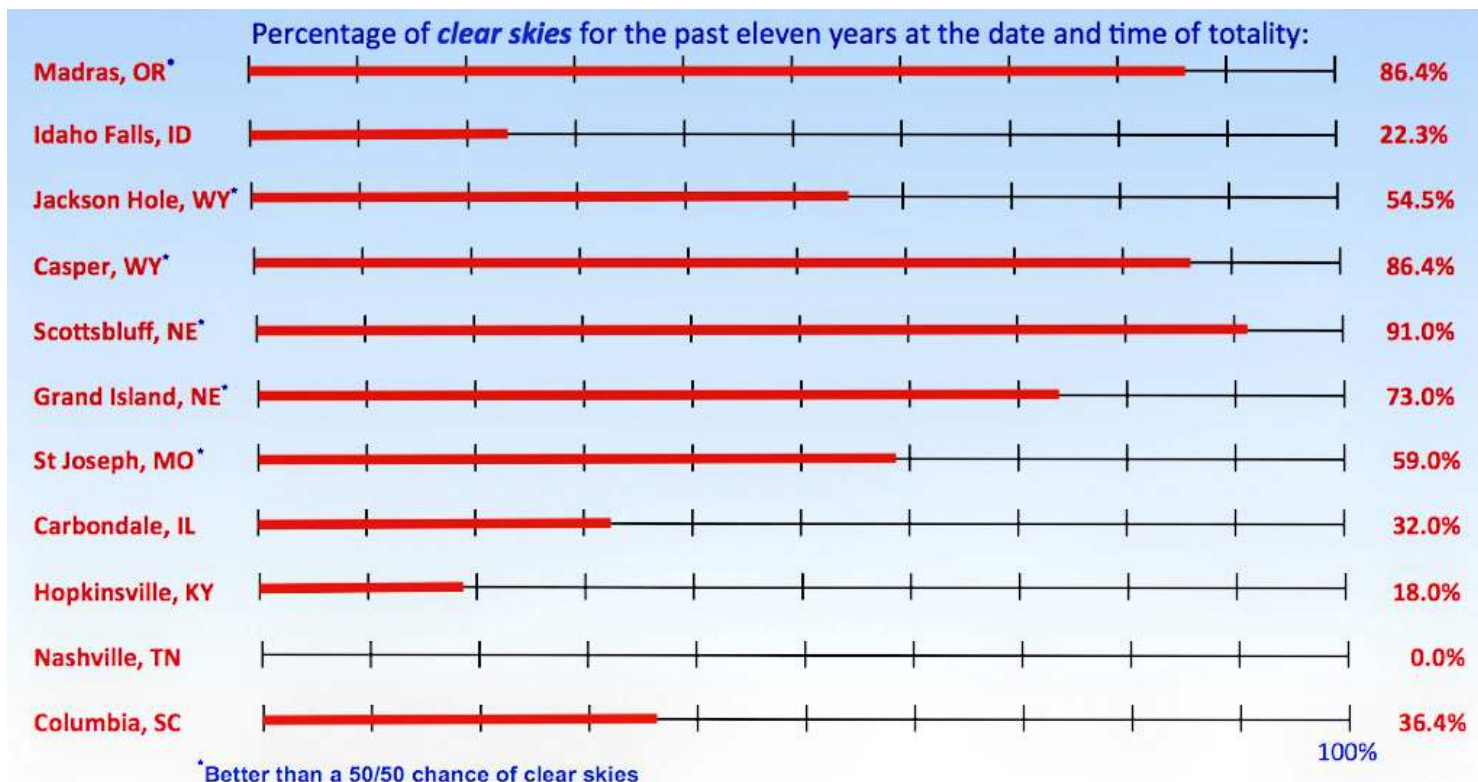
Another website, <http://www.wunderground.com/history/>,

shows historical weather data. We tabulated the sky conditions for each of the cities, at the time that each city will experience totality, on every August 21st back to 2005 (see chart at bottom of page).

Of the eleven cities, six had better than a 50/50 chance of clear skies during the upcoming solar eclipse. Further investigation of the driving distances to these cities, etc., showed us that there were no further distinguishing features, that they were all equally likely to be a good choice for our viewing venue. Our top three choices are Scottsbluff, Casper and Madras.

We will likely refine our process over the next year or so and come up with more stringent criteria, and hopefully narrow down the list of candidate cities. As we get feedback from the membership, we will develop a better idea of whether we are all on our own or traveling together. Whether we'll be traveling light or bringing along or recording and viewing equipment.

One thing is for sure, even at this early date: Those of us who go and get to experience a total solar eclipse will have quite a story to tell.



Scope for Sale:

Meade LX200 8" SCT with original instruction book, diagonal prism & 7 super plossl eyepieces, super wide angle: 40mm, 32mm, 26mm, 12mm, 4mm, 6.4mm & 15mm with the best tripod available, super heavy and scope is in original boxes.. Asking \$1300 OBO Contact Roger at Schollra@aol.com or 480 991 0133.

Way Out There - Moons Behaving Badly, Part 1

By Kevin Witts, PAS Secretary

We look up at night for much of the month and there she is, our beautiful Moon. She impacts our tides, helps stabilize our rotation and even fends off an occasional asteroid -- and she always shows us her best face. She is, by far, the largest moon in our Solar System relative to the "parent" planet and her consistent orbit allows us to navigate by her and precisely predict her movements.

However, other Moons in the Solar System are not so well behaved.

Let's take Io for example. Jupiter's third largest Moon is one of the most inhospitable places mankind has ever encountered. Larger than Earth's moon, Io is the driest and most volcanically active body in our Solar System. Over 400 active volcanoes are fueled by the tremendous gravitational pressure placed on Io by the host planet Jupiter and three sister moons, Ganymede, Callisto and Europa. Plumes of sulfur and sulfur dioxide shoot 300 miles into the air and then fall to coat its plains. Unlike most satellites in the outer Solar System which are mostly composed of a little rock and a lot of ice, Io is primarily composed of silicate rock surrounding a molten iron core. The moon has virtually no impact craters due to lava flows that run more than 300 miles in length and paint the surface various shades of yellow, red, white, black, and green. Not a nice place for a relaxing picnic.

And then there's Iapetus, which spends its time circling Saturn. Iapetus isn't particularly large. It doesn't move especially fast or have an extreme gravitational pull on anything. Iapetus' issues are that it has a bulging waistline (don't we all?) and it also cannot make up its mind what color it wants to be. Looking very much like a

gigantic walnut, Iapetus has an enormous equatorial ridge and flattened poles, causing it to be neither spherical nor ellipsoidal. The "waistline" ridge runs over 800 miles around the planet and is over 9 miles high, twice the height of Mt. Everest. And yet, Iapetus' ridge isn't its most distinguishing feature. Like most moons, Iapetus is tidally locked, showing the same face to Saturn at all times. Early scientist were perplexed by the fact that they could only see the moon on the west side of Saturn and then it would seemingly disappear. It was later concluded that one whole hemisphere of the body is extremely white in color while the other hemisphere is strikingly dark. Of all Saturn's moons, Iapetus has the warmest daytime temperature and the coldest nighttime temperature, which causes its icy surface to evaporate and then refreeze dramatically during its 79 day rotation. The color contrast closely resembles the familiar "yin-yang" pattern associated with eastern culture. Photos taken of the moon show a very distinct meridian that divides the dark from the light.

Phobos and Deimos don't play well together. The two moons, both believed to be captured objects, travel very different paths through the skies over Mars. Speedy Phobos orbits closer to its host planet than any other known natural planetary satellite. It rises in the west, sets in the east 4 hours later, and then rises again in the same Martian day. Phobos, due to its small size also shows a total lunar eclipse nearly every night. Deimos, on the other hand, rises as expected in the east, but moves very slowly. In fact, Deimos then takes almost 3 full Martian days to set in the west, as it slowly falls behind the rotation of Mars. Since Phobos orbits Mars faster than the planet

itself rotates, tidal forces are slowly drawing it closer to Mars. At some point in the future, Phobos will either be torn apart or may impact Mars. Deimos, on the other hand, is far enough away that its orbit is being slowly boosted to continually move farther and farther from its host planet, similar to Earth's moon. Both are small, rocky and oddly shaped. Their erratic movements create a real challenge in predicting when they'll be seen from the Martian surface.

And finally, there's poor little Nereid, who spends its time circling around Neptune. The little moon is only 110 miles in diameter and is so far from its host that it takes over 360 days to complete a single Neptunian orbit. And while most moons orbit their host planet in a circular or slightly elliptical fashion, Nereid has an extremely eccentric orbit. At its closest point to Neptune, the moon sits less than 850,000 miles from the surface of the planet. However, at its farthest orbital point, Nereid rests almost 6 Million miles away! The moon also has been observed to have extensive differences in brightness as it makes its bizarre journey through the heavens. These variations can happen over years and months, but sometimes even over a few days. They persist even after a correction for distance and an accounting for phase effects. An erratic orbit and inexplicable variances in brightness make Nereid one of the most oddly behaving moons in the Solar System.

So, the next time that you glance up in the night sky and see our beautiful moon looking down on you, give a little word of thanks that OUR companion is calm, reliable and predictable. Stay tuned for more odd moon behavior in our next issue...

Room Update for PAS Events at PVCC

Many thanks to Jenny Weitz who is the PAS/PVCC Liaison and one of two PAS Members-at-Large. Jenny has worked up a 2015-2016 schedule for the PVCC rooms. Please check for the room number on the Calendar listing for that date at pasaz.org to be sure you are going to the right room for the event. Here is the breakdown as of now: PAS Meetings will be held in LS-204.

Meeting of the Minds will be held in LS-205 and the awards ceremony will be in a mystery room only known to PAS members since this is a private event. If the Meeting of the Minds is to be a private meeting, the room will be announced in the private calendar. Thank you all for your participation as we enjoy the next year of PAS events.



Earl DeLong will be presenting "Selecting the Proper Telescope Eyepiece" at the Sept 10 Meeting.

Lunar Eclipse Scouting Trip Sept 27

By Terri, Event Manager

Kevin Witts met with Storm Sallas, William & Terri Finch at Ohya Korean Kitchen & Bar by ASU West about 4pm on Sunday Aug 9. We had a super dinner of Sushi and then drove in separate vehicles to Roadrunner Park. We checked out the location Kevin suggested for set up at this park. We then jumped in his vehicle and went to two other parks to scout out a location for a public viewing events of the Total Lunar Eclipse of Sept 27, 2015.

When done, he brought us back to our car, we chatted, and departed. Then, Kevin created this awesome email to send out to the PAS Members, asking them for input as to where to have this event, based on the research he had done and shared with me.

Here's the items we were voting on, with the pros and cons for each location, and provided to me via Kevin.

We are scouting a location for the Lunar Eclipse viewing event scheduled for Sunday, September 27th.

There will be a full lunar eclipse that evening, which will have already begun as the Moon rises over Phoenix. That ensures a spectacular view as the Moon clears the mountains to the east at approximately 6:20 that evening.

This is a great opportunity to get the public involved and present them with an amazing view. It's early enough on Sunday evening that the whole event will likely be over by 8:30. Light isn't really an issue for this event as the moon is the object and there is no need for dark skies. Also, once the Moon rises, trees will not be an issue with any of the sites listed below.

Option 1 - Roadrunner Park

Cactus Rd at 36th St. - we will need to set up on the far east side of the park along 36th Street near Charter Oak Rd.

(location is less than a mile east of Rt 51 at the Cactus Rd.exit)

Pros : Park is usually crowded at that time of day in September. we will have a built in audience. Also, somewhat clear view of the eastern mountains with a few "far-off" palm trees as the only obstruction.

Cons: setting is just ok as we'll be at the far edge of the park looking over the neighborhood. A few small tree obstructions possible right at Moonrise. 36th St has some car traffic. May have to transport any scopes a bit to the sight based on the parking situation. There are plenty of parking spaces, but they are first come-first served.

Option 2 - Paradise Valley Park

On 40th St. between Bell Rd. and Union Hills - We will need to set up on the far west (back) side of the park near the Dog Park area

Pros : Park will likely have some crowds at that time of day in September. We may have a built in audience. Also, somewhat clear view of the eastern mountains with a few low trees as the only obstructions. There is tons of very close parking for everyone, PAS and visitors.

Cons: setting is just ok as we'll be at the far edge of the park with a large dirt area near the cars....not very pretty. A few small tree obstructions in the far distance possible right at Moonrise.

Option 3 - Coyote Basin Park

On Beardsley Rd just east of Cave Creek Rd. (This park sits behind the Costco at the intersection of Cave Creek Rd and Rt 101)

Pros : This is an absolutely beautiful and very underutilized park. It has a completely clear and beautiful view of the east valley mountains, so the Moonrise should be incredible. There are sloping hills that face east and people can be encouraged to bring blankets and lawn chairs to relax on. If set up early enough, we may be able to capture some Costco shoppers for the event

Cons: This park is very underutilized, so it's not likely that there will be many people using it at the time of the event. There is minimal parking in the small park lot, however there is plenty of parking in the adjoining neighborhood and on the Costco/ Taco Bell lot next to the park. Those bringing scopes will need to do a bit of transporting to get the scopes to the spot. There are paved sidewalk that lead to the set-up area, but parking is about 100 yards away.

Voting was set for a deadline of Tuesday evening 11:59pm on Aug 11 through email. I did the tally of this vote and the results are mentioned in the Article in this issue named "September 27 Total Lunar Eclipse Public Viewing Party." Many thanks to Kevin for taking us around to the different locations, checking with the parks department to make sure we have all paperwork signed, if necessary, and helping to get this event happening. See you there!

September 27 Total Lunar Eclipse Public Viewing Party

By Terri, Event Manager & Kevin Witts, PAS Secretary

Kevin writes: The Phoenix Astronomical Society will be hosting a free Lunar Eclipse Viewing Party on Sunday, September 27th from 6:15pm -8:30pm.

A spectacular complete Lunar Eclipse will take place that evening as the Moon rises in the East. Lunar eclipses occur when the Moon passes directly behind the Earth and the resulting shadow blocks sunlight from illuminating the Moon. The Moon will already be in the first stages of the eclipse as it rises over the mountains to the east of Phoenix, assuring an amazing sight.

There will be telescopes set up for the event and the public is welcome to have a

look. It's not even necessary to view the eclipse through a telescope as the view is incredible, even with the naked eye. Binoculars also afford a great views of the event.

The Eclipse Viewing Party will be held at Coyote Basin Park. The park is located at 2730 E Beardsley Rd, Phoenix, AZ 85050, just east of Cave Creek Rd, behind the Costco. The park features a beautiful grass-covered hill with an unobstructed view of the eastern sky. It's perfect for families and an ideal spot to bring a lawn chair or a blanket (and a picnic dinner!). The park does not have restroom facilities, but there are some fast food establishments within

easy walking distance. Space in the parking lot is limited, but there is plenty of parking in the surrounding area.

Come join the Phoenix Astronomical Society for this incredible event. Have a look at a fully-eclipsed Moon through a professional telescope and enjoy an early evening event in a beautiful park as the weather begins to cool in late September. Completely clouded out skies may cause cancellation of the event. Watch this space for more details should the weather not cooperate and RSVP your attendance at Events@pasaz.org.

Terri writes: This event is open to the

See Lunar Eclipse Party on page 10



Solar Wind Creates—and Whips—a Magnetic Tail Around Earth

As Earth spins on its axis, our planet's interior spins as well. Deep inside our world, Earth's metal-rich core produces a magnetic field that spans the entire globe, with the magnetic poles offset only slightly from our rotational axis. If you fly up to great distances, well above Earth's surface, you'll find that this magnetic web, called the magnetosphere, is no longer spherical. It not only bends away from the direction of the sun at high altitudes, but it exhibits some very strange features, all thanks to the effects of our parent star.

The sun isn't just the primary source of light and heat for our world; it also emits an intense stream of charged particles, the solar wind, and has its own intense magnetic field that extends much farther into space than our own planet's does. The solar wind travels fast, making the 150 million km (93 million mile) journey to our world in around three days, and is greatly affected by Earth. Under normal circumstances, our world's magnetic field acts like a shield for these particles, bending them out of the way of our planet and protecting plant and animal life from this harmful radiation.

But for every action, there's an equal and opposite reaction: as our magnetosphere bends the solar wind's ions, these particles also distort our magnetosphere, creating a long magnetotail that not only flattens and narrows, but whips back-and-forth in the onrushing solar wind. The particles are so diffuse that collisions between them practically never occur, but the electromagnetic interactions create waves in Earth's magnetosphere, which grow in magnitude and then transfer energy to other particles. The charged particles travel within the magnetic field toward both poles, and when they hit the ionosphere region of Earth's upper atmosphere, they collide with ions of oxygen and nitrogen causing aurora. Missions such as the European Space Agency and NASA Cluster mission have just led to the first accurate model and understanding of equatorial magnetosonic waves, one such example of the interactions that cause Earth's magnetotail to whip around in the wind like so.

The shape of Earth's magnetic field not only affects aurorae, but can also impact satellite electronics. Understanding its shape and how the magnetosphere interacts with the solar wind can also lead to more accurate predictions of energetic electrons in near-Earth space that can disrupt our technological infrastructure. As our knowledge increases, we may someday be able to reach one of the holy grails of connecting heliophysics to Earth: forecasting and accurately predicting space weather and its effects. Thanks to the Cluster Inner Magnetosphere Campaign, Van Allen Probes, Mars Odyssey Thermal Emission Imaging System, Magnetospheric Multiscale, and Heliophysics System Observatory missions, we're closer to this than ever before.

Kids can learn about how solar wind defines the edges of our solar system at NASA Space Place. <http://spaceplace.nasa.gov/interstellar>

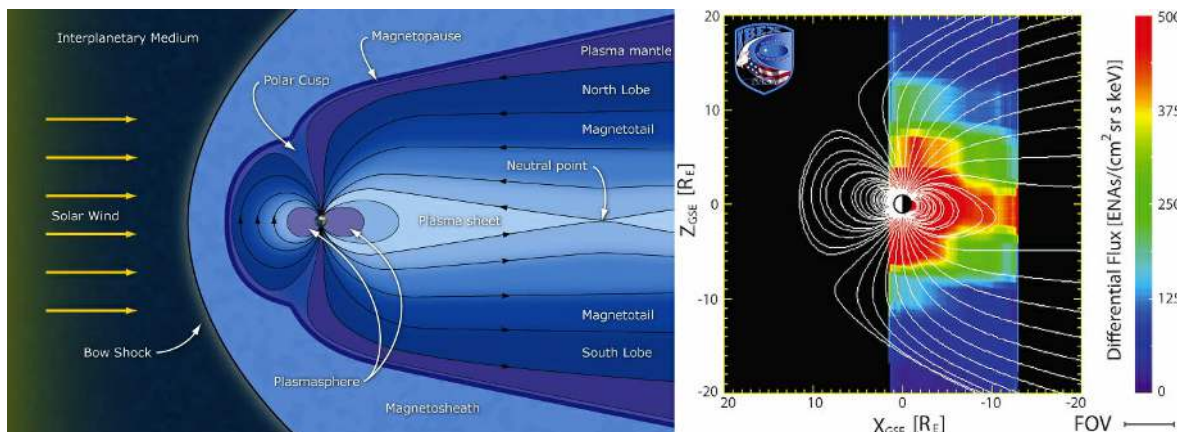


Image credit: ESA / C. T. Russell (L), of Earth's magnetic tail and its cause: the solar wind; Southwest Research Institute / IBEX Science Team (R), of the first image of the plasma sheet and plasmasphere created around Earth by the solar



Sam Insana will be presenting “Flagstaff Festival of Science” at the Sept 3 Meeting. He will also be sharing some “Scientific astronomy research projects” at the Sept 10 Meeting.



Kevin Witts will be presenting “Visiting the Rocket Garden” at the Sept 10 Meeting.



Alex Vrenios will be presenting, as a Team with Sam Insana “Solar Eclipse of 2017” at the Sept 3 Meeting. Alex will also be presenting “Beyond Hubble” at this same meeting.

Continued from page 8

Lunar Eclipse Party

public. Everyone is welcome and we'd love for you to attend. Come view through our telescopes to see the total lunar eclipse. Bring chairs or blankets, snacks and drinks and enjoy the evening with us. Should bad weather get in the way, we suggest you drop an email RSVP to Events@pasaz.org.

If we need to cancel the event, an email will go out by 4pm the day of the event to let you know not to attend due to bad weather. Weather factors that will cancel this event are high winds, too many clouds in the East where the Moon will be rising, falling rain of any kind. Rain is no good for telescopes!

A telescope is not needed to see this event, but this is a once in a lifetime event occurring at a time, and on a day that is convenient to be seen (and not super late in the night or super early in the morning). Everyone should attend. We hope to see you there!

Solar Day at Bookmans June 20

By Terri, Event Coordinator

What a super hot day, but I must thank Sam Insana and Mike Marron for providing a cooler with cold drinks for the team. In attendance from PAS were: Sam Insana with his 8" with solar filter and his PST (Personal Solar Telescope), Rodney Fong as my assistant, Rick Cunningham, who we haven't seen in a very long time, who brought his 8" with solar filter, Kevin Witts who brought his 8" with solar filter and his Lunt Solar Scope (which was awesome!), Terri Finch did the handouts and had help from Storm Sallas at the PAS table on the Bookmans sidewalk. Mike brought his Meteorites and two of the PAS canopies which were set up for the team to get under and away from the Sun. William pointed his Astroscan at the Moon along with Don, who also aimed his 8" at the Moon. Set up was 1pm and the event ran from 2pm to 4pm.

It was so hot that part way through Sam told me that two of the chairs in the sun died due to the heat - both fell apart when people sat on them! Our hostess, Katy Spratt came out to see us near the end of the event which was great fun, though by the end we were totally overheated. Many thanks to Katy for inviting PAS to attend.

After this event, the group went to Carlos O'Briens for dinner. Daniel took good care of all of us: William, Terri, Don, Storm, Sam, Rodney, Kevin, Mike and Joe. We look forward to the next Bookmans viewing session, solar or evening.

Rick Cunningham writes: Today's public outreach event at Bookman's was to allow the public a chance to view the sun safely. The temperature at the start of the event was 111°F, and by the conclusion of

the event exceeded 115°F. On the asphalt surface where the telescopes were set up temperatures were yet warmer! Approximately seventy-five people viewed the sun through one or all the solar equipped telescopes provided by Sam, Kevin, and Rick. All the solar telescopes were equipped with slightly different filter types and styles, which demonstrated the solar surface, corona, or both simultaneously. Multiple sunspots were on the solar surface to the delight of viewers. Coronal mass ejections were also clearly visible but the telescopes were very hot by the end of the event. A special thanks to Sam who provided a large cooler filled with plenty of ice-cold bottled water and beverages today. All PAS members present survived this event.



Sam, Rodney, Kevin & Rick doing the Solar Day event at Bookmans. Photo by Terri.



Kevin, Sam & Rodney in front of Bookmans for Solar Day. Photo by Terri.

Sell Your Astronomical Equipment

By Terri, Event Coordinator

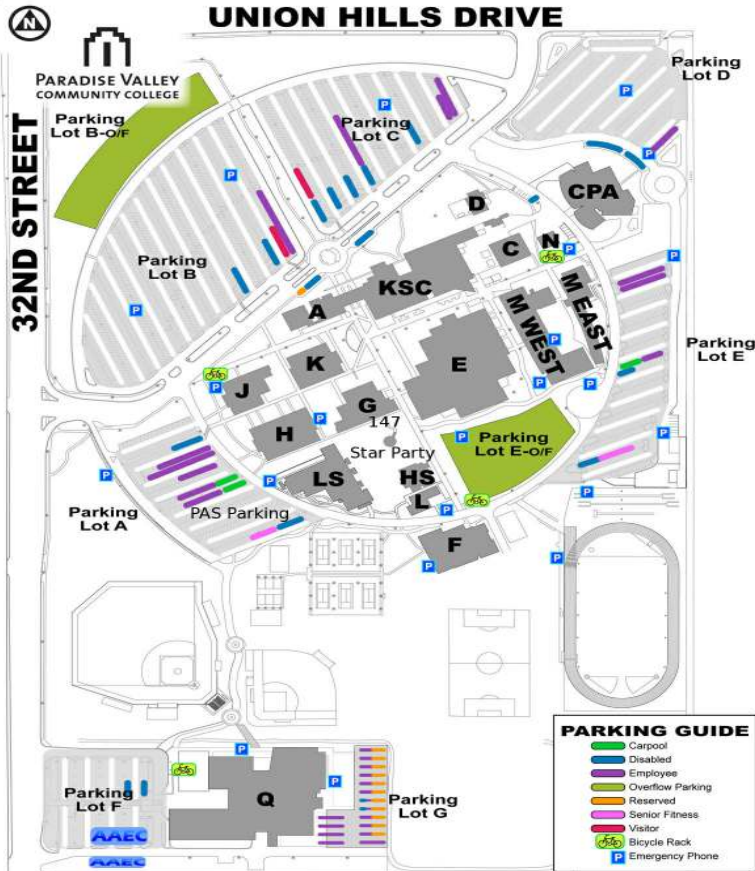
The PAStimes Newsletter is your means to selling your old, unwanted, but loved and used astronomical equipment. Write an ad with description & photos, get it in the next issue of the PAStimes News-

letter. Also, the ad will be posted in the For Sale PAS Forums & sent out to the 450 Astronomy Loving Arizona Residents who are on the Public Email Notification List Serv that I post Upcoming Free/Public

Events to once a month. PAS Members may post items for sale, in the newsletter, for free. Send them to Events@PASaz.org.

Map of PVCC Main Location

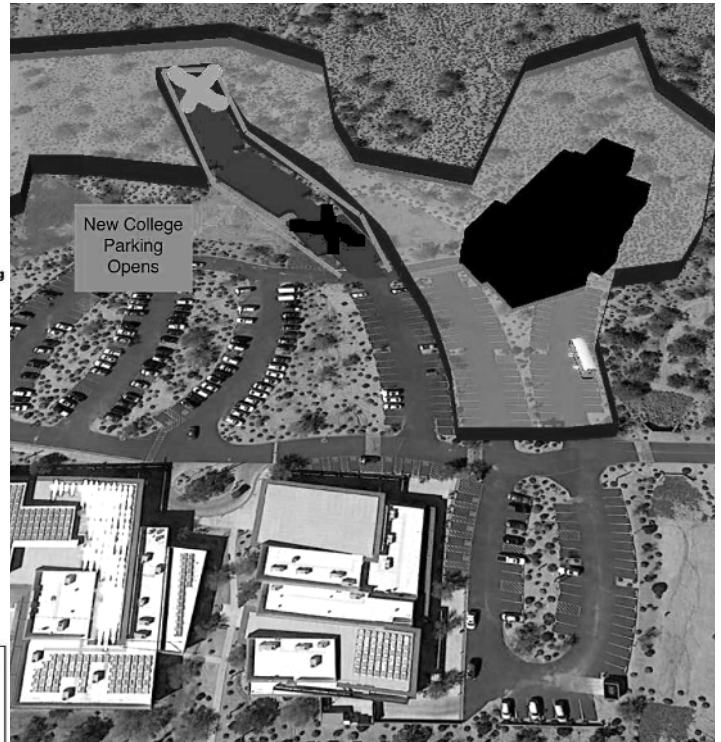
18401 N. 32nd Street | Phoenix, AZ 85032



Black Mountain Campus of PVCC

60th Street and Carefree Hwy

34250 North 60th Street, Scottsdale, AZ 85266



The white X is Scope set up. The dark X is PAS Parking.

September 2015

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 Neptune at Opposition	2	3 PAS Meeting	4	5
6	7	8	9 CTCA (Private)	10 PAS Meeting	11	12
13	14	15	16	17 BMC Public Star Party	18 School Star Party (Private)	19
20 Free Telescope Workshop	21	22	23	24 Free Telescope Workshop	25	26
27 Lunar Eclipse Star Party School Star Party (Private)	28	29	30			

Don Boyd
PAStimes Editor
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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>

Sep 6: Members Night

Oct 1: Rik Hill "The Latest with CSS and Near Earth Asteroid Surveying"

Nov 5: TBA

Dec 2 (Wednesday): Astronomy Equipment Swap Meet: Bob Ewing "The Cosmological Distance Scale"

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

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

What's Up For September?

By Rod Sutter, PAS Past President

Planets

Name	Date	Rise	Set
Mercury	08-15-15	08:06	19:18
Venus	08-15-15	03:27	16:28
Mars	08-15-15	03:57	17:19
Jupiter	08-15-15	05:32	17:56
Saturn	08-15-15	11:30	21:53
Uranus	08-15-15	19:41	08:25
Neptune	08-15-15	07:51	05:09
Pluto	08-15-15	14:41	12:53

All Times Arizona Time

September 15 2015

Sunrise: 06:09

Sunset: 18:35

Full: August 29

Q3: September 05

New: September 12

Q1: September 21



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