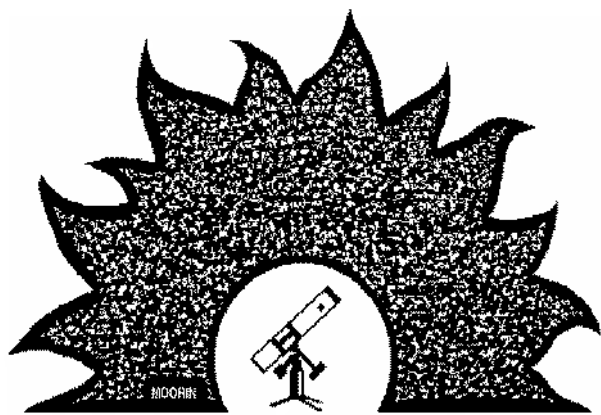




PAStimes

Phoenix Astronomical Society

www.pasaz.org

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PHOENIX ASTRONOMICAL SOCIETY — ESTABLISHED 1948

“Radio Astronomy” at the January Meeting

by Dr. Alex Vrenios

Alex discusses the early pioneers, how radio and optical imaging differ, what kinds of objects are unique to radio astronomy, the SETI project and finally, what kinds of radio astronomy we amateurs can do - and which organizations support it.

Terri adds: Alex is a PAS member and long-time teacher. He knows his subjects well, and carefully researches each of his

presentations. His enthusiasm is contagious!

Doors open at 7:00 pm for setup and socializing until 7:30pm. The meeting begins with 10-15 minutes of announcements, after which we turn the meeting over to the guest speaker. Water will be provided by the PAS Snack fund (be sure to donate a little to

See Radio Astronomy on page 2



Alex Vrenios will give the January 2016 PAS Meeting Presentation. Photo by Terri.

PAS Meeting of Dec 2, 2015

By Terri, Event Manager

I wish to thank Bob Ewing so much for sharing “The Continuation of the Cosmological Distance Scale” at the December meeting. Bob engaged the audience with this informative topic and there were many questions and discussions on this topic.

We also had our yearly PAS Astronomy Swap Meet to help you sell your items, beginning before the meeting and concluding right after the drawing of the raffle ticket. There were only a few items at this year’s meet, but it looked like everyone was

able to sell their stuff.

President Sam opened the meeting with the welcoming of new attendees and the introduction of all the officers present after which we turned the night over to Bob Ewing.

At the conclusion of Bob’s presentation, various members spoke about John Pulis in celebration of his life, Sam talked about the Geminids Meteor Shower party that was coming up at Mike’s in mid De-

See Dec 2 Review on page 8



Bob was a wonderful guest speaker at the Dec 2 PAS Meeting. His topic created many great discussions among the members. Photo provided by Bob.

PLANS FOR THIS YEAR: PAS SOCIAL Jan 30

By Terri, Event Manager

The PAS Social is our annual EVENT OF THE YEAR and is not a Christmas Party, but a gathering where we get to know our fellow PAS Members. You can bring your spouse and immediate family only - no guests, please.

The location of this event is at Mike’s home in Carefree: map, directions and RSVP can be found on the PAS website. The event begins on Saturday January 30 at

4pm, though we will not eat until 4:30pm to allow everyone to arrive. Those wishing to help me set up should please be there around 3pm (Thanks!). The games begin about 6pm and go until we are done for the evening.

Here are the plans for this year’s event!

1) Food - lots of food. This is a potluck. Please bring a main dish to share,

enough to feed your attending party plus 5 people. It is best if each person brings a dish that can feed 10, to assure that there is enough to go around. Please bring a drink to share also - a 2 liter bottle of pop, 6 pack, or some equivalent amount. Please, no alcohol, as kids may be attending. I believe I can also get a case of water for the event from Mike, or the PAS Snack Fund..

2) White Dwarf Gift Exchange. What

See PAS Social on page 3

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January 2016 Upcoming Events

By Terri Finch, Event Manager

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

Jan 14: PAS Meeting at PVCC in Room LS 204. Come enjoy a wonderful presentation by Alex Vrenios. Bring a snack to share. Bottled water provided by PAS snack fund. Everyone welcome. Doors open 7pm. Meeting begins 7:30pm. Here's the link for more details about this event:

<http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1749&day=2016-114&c=1>

Jan 15: School Star Party (Private) <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1867&day=2016-115&c=2>

Jan 16: PAS Music Jam. Potluck at 5:30 and Jam begins at 7pm. PAS Members only and their immediate families invited. RSVP required. <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1872&day=2016-116&c=2>

Jan 21: PVCC Free Telescope Workshop at PVCC main campus, 32nd Street and Union Hills Rd - 7pm to 10pm. 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=1877&day=2016-01-21>

Jan 24: 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=1747&day=2016-124&c=1>

Jan 27: Private Meeting of the Minds. This is a meeting for PAS Members Only to discuss anything having to do with the club or PAStimes Star Tours. Doors open 6:30, and meeting begins at 7pm. Room is announced in the private calendar. More details are at this link (if you can't get in this link, you are either NOT a PAS member, or you don't have access yet. Email Terri Events@pasaz.org and she can help you figure out why you can't get in to find

out what room we are meeting in. <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1848&day=2016-1-27>

Jan 28: School Star Party (Private) in Glendale

<http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1862&day=2016-128&c=2>

Jan 28: School Star Party (Private) in Anthem

<http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1875&day=2016-128&c=2>

Jan 29: Black Mountain Campus Public Solar Viewing Event near the newly built Aquila Building on campus. Event is from 10am to 11:30am. For more info, and PAS Members with Solar Scopes, please RSVP your attendance here: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1871&day=2016-129&c=1>

Jan 30: The PARTY OF THE YEAR - the PAS Social. Set up is 3pm. Socializing begins at 4pm. Potluck is at 4:30pm and the Games begin at 6pm. Be sure to RSVP your attendance, it is required. This is a PAS Members and their immediate family only event. More details can be found here: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1873&day=2016-130&c=2>.

Continued from page 1

help out for next month's water). The Editors wish to ask that everyone enjoying this Issue of PAStimes, please take a moment to take a short survey. Please visit this link:

Radio Astronomy

<http://tinyurl.com/h2qm94l> Everyone is welcome at the January meeting. Bring a snack to share and a Friend! For more info about the upcoming meeting on Jan 14th,

please visit this link: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1749&day=2016-114&c=1>

Continued from page 1

is this? It's a game we play at every PAS Social, whereby you bring a wrapped, disguised astronomy-related gift, worth \$20 or more. See the associated article for details.

3) RSVP is Required! I need to know who is attending. If you bring a guest, they must also bring food, drink and a gift for the game (if they are playing it with us). You can RSVP by email Events@pasaz.org up to Thursday Jan 28 by end of day. Please wear your PAS name badges. Those without name tags may end up with a sticky name tag from me. First name is all I ask to be on the name tag.

4) Sign up at PerfectPotluck.com with the main dish, any extras and drinks you will be bringing. We are avoiding duplicates. For example: One person might bring pizza, so no one else should be bringing that. Something like wings however can come in many styles, so if they are bought from different locations, the variety can be nice. The first to RSVP their food, gets to bring it, so think about it and sign up today. The list will be at PerfectPotluck.com. See the Forum Thread for the login. Try to bring something different and unique: it's more fun for our taste buds that way. Home

made food is always appreciated.

5) Bring a movie to share on DVD, if you plan to stay later after the crowd has departed. This way, we can watch something that will keep our attention as we wind down the evening and do the clean up. Help is requested for the clean up.

6) Dart Game - We hold the dart game in the front yard at Mike's home. Darts will be provided, but it would be helpful if we had more dart boards to make the game flow more quickly. Also, you may wish to dress warmly. Please be careful throwing your darts. No trophy this year, let's consider a prize given at the Awards Ceremony or maybe one of the donated door prizes. Competition is stiff, however everyone should play because it is fun.

7) Bean Bag toss: provided by Sam, who is also providing the prizes for this game, 1st and 2nd place.

Door prizes are needed. If you can, drop me an email to let me know how many you can provide. Door prizes can be anything and don't have to be astronomy related. Just wrap them and tell me how many you have to donate. Past door prizes have



Attend this year's event and experience side splitting laughter! Photo by Terri Finch

been mugs, knick knacks and other non astronomy-related items. The more door prizes we have available, the more can be awarded.

We hope everyone can attend - it is always lots of fun. The food and people are a good enough reason to come, even if you don't wish to play the games with us. Many thanks goes to Mike Marron for hosting this year's event. See you there! Here's the link to the Private Calendar so you can RSVP today:

<http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1873&day=2016-1-30>.

PAS Music Jam is here on Jan 16

By Terri, Event Manager

Based on an idea from John Pulis (RIP), PAS began a number of years ago to do an annual Music Jam. Everyone really enjoyed the event and we even made a video of it. Unfortunately, due to health issues, John wasn't able to attend, but the tradition continues in his honor.

If you know how to play music, either by sight reading or by ear, drop an RSVP into the calendar listing for this event and mention what instrument you will be bringing or whether you are doing rhythm, singing or just listening. We invite all PAS Members to attend. You can also borrow a tambourine or bring your own. This is a members-only event, so please no guests. The potluck (please bring a main dish!) will be at 5:30pm with music starting at 7pm.

for the potluck.

After the Jam, which has been 2 to 3 hours in length in the past, we may stick around to watch a movie. All the details and any changes will be in the PAS Private Calendar and Private Forums with members-only access. Come make music with us! The music books for which we will be playing from are being provided by Ed Wurst, so you must RSVP to have a book to use. Don't forget to sign up for Perfect Potluck with your main dish and any extras you plan to bring along for the shared dinner, ever! See you there! Here's the link to RSVP your attendance:

<http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1872&day=2016-01-16>.



Bruce picking the banjo at the PAS Music Jam of 2015. It was some great music to be shared.

Photo by Terri.

Public Event: Solar Viewing at BMC Jan 29

By Terri, Event Manager

The Black Mountain Campus of PVCC (located at 60th Street and Carefree Hwy) will be hosting a grand opening celebration for the new Aquila building from 10 am to 11:30 am on Jan 29. Everyone is welcome to attend. To get to the site near the newly

built observing deck, take your first right after entering the campus. BMC has asked that PAS provide solar telescopes for the occasion. This is your chance to view the Sun through several safely filtered telescopes. We'd love to see you there! More

details can be read about this event and the new building at this link: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1871&day=2016-01-29>.

PRESIDENT'S CORNER

By PAS President Sam Insana

In order to continue to have an outstanding astronomy club, I believe we should recognize that all of us need to treat each other with respect. Over the last month there have been some disagreements, which at times can be healthy to get a diversity of opinion and grow in new directions. I also feel, however that many, if not most, disagreements should be worked out in person

or on the phone between the parties, not through email to the entire membership. If the problem can't be resolved, then we should bring the matter up at a Meeting of the Minds, not a general meeting where the public attends.

We have a great membership filled with talented, educated people with a desire

to enjoy astronomy all of whom contribute to our efforts. Our society members need to feel that we can each take part in the activities without feeling micro-managed by anyone. Let's relax, not be so uptight about following a host of rigid rules and just enjoy astronomy and each other's company

HOW TO PLAY THE WHITE DWARF GIFT EXCHANGE GAME

By Terri, Event Manager

For this game at the social, we gather in a circle in the designated room. There is a table with gifts on it, each one wrapped and disguised so no knows what it is or who it is from. Everyone attending the Social is given a raffle ticket in trade for their wrapped gift. You must provide a gift to be involved in the game. The gift must be of a value of \$20+. There can be more than one item in the box - disguise it well.

We randomly draw a ticket and Player 1 takes a prize from the table. Another ticket is drawn, and player 2 takes a prize from the table OR steals the gift from Player 1. Another ticket is drawn, and Player 3 can take from the table or steal from Player 2 or 1.

Rule 1: No stealing gifts from the person who just stole from you. If Player 2 takes from Player 1, Player 1 can not take the gift right back from Player 2. However, Player 1 can take from Player 3, and Player 3 can then take from Player 2, thus if Player 2 takes from player 1, Player 1 can take from Player 3 and get their original gift

back if they desire.

Rule 2: All gifts must be visible. No hiding gifts behind your legs or under your chairs. Put them out in the open for others to steal.

Rule 3: It is more fun to steal and have been stolen from, than to watch a Player take from the table. STEAL! That's the whole purpose of the game. Fight for the gifts. Just fight nicely - no rough play! And laugh your head off! Treat each gift as if it were delicate, breakable, fragile glass.

Rule 4: No opening gifts until the designated time.

When all gifts have been taken from the table, a new ticket is drawn. That player will read anything stuck to the bottom of their package (if applicable), and then open the gift. When the gift is completely opened and held up for photos, then the player to the left or right will then open their gift in the same manner.

Rule 5: Always allow time for the photographers to get the photos they desire of

you with your gifts.

When we are all done opening the gifts, if you received a gift you do not wish to keep, you may put the unwanted gift on the table and before you leave for the night, choose something else that another player left behind.

Please, everyone playing the game be sure to help clean up the papers from the wrappings on the floor and put away the chairs so we can then do another activity, or watch a movie. If you aren't playing the game and would like to help out, please bring a digital camera so that you can take photos of the event and send them my way for inclusion in the PAS Photo Gallery. That would be greatly appreciated! Here's the link to RSVP in the Private Calendar to attend:

<http://www.pasaz.org/forums/calendar.php?do=getinfo&c=1873&day=2016-1-30>.

RSVP is required because I may have something special I am planning that requires knowing who is attending.

ASU West Star Party Oct 8

By Terri, Event Manager

ASU West is a recurring star party that PAS does. Each year, once in the fall and once in the spring, Paul Schmidtke, ASU West Professor, invites PAS Members to bring their telescopes and hold a star party for the public at a semi-dark location on the ASU West campus. This year we enjoyed totally clear skies. The temperatures were a bit warm, but the crowd of people attending made us forget about the heat of the evening.

In attendance were William and Terri Finch with handouts and PR, Kevin Witts

with his fantastic 8" telescope (showing Pluto, Neptune and Uranus), Howard Moneta with his 8" scope (showing the Andromeda Galaxy and several other objects), Pete Turner with his 9.25 inch scope and Don Boyd with his 8" scope. Paul had a scope there, too, showing Saturn until it set behind a building. Paul's student, Daniel also brought a "cute" scope that brought in Saturn nicely. Mike had his meteorites and as usual, stole the show. Ray Adams attended as well, but didn't bring a scope. I kept him busy doing handouts. Thank you Ray! William also helped with the scopes and the

set up.

The event was scheduled from 7pm to 9pm though we had attendees before and after those times, mostly hanging around talking with Mike. It was a wonderful, successful event!

Prior to the star party, the Telescope Team and Paul met at Arby's across the street from ASU West, for dinner. HAPPY BIRTHDAY PAUL! We had a great dinner, great company and wonderful conversation. Looking forward to the next ASU West Star Party on Mar 31, 2016.

The Challenge

By Kevin Witts, PAS Member

Have you ever viewed all 9 planets, the Sun and potentially 6 moon's all within a 12 hour period????!! I never have, but, provided the sky cooperates, and you don't mind early morning hours, Thursday provides that opportunity!* Begin Thursday evening 10-8-15, at around 6:30 pm. It should be dark enough to view Saturn in the Southwestern sky with the naked eye. Using a moderately powered scope, you can probably catch Titan as well.

Just to the left and above Saturn, in the Southern Sky, Pluto will be up. At dusk a few weeks ago, before any stars were visi-

ble, I was able to catch Pluto in my scope as it was the only visible light in its area as the Sun went down. An 8" scope should be able to catch Pluto before any other stars come out

At approximately 7:30pm, Neptune should be achievable in a moderate-to-large scope

At approximately 8:30, Uranus should be viewable in a moderate-to-large scope.

Time to go to bed. Get up at 5:20 or so Friday morning, 10-9-15.

Drink a sip of coffee, but don't daw-

dle... look down at the ground and view the Earth!

Find a clear view of the Eastern horizon and sky. You'll see Venus, Mars, Jupiter and the crescent Moon all lined up in the east. View Jupiter through strong binoculars or any scope and you'll see 4 Moons (Io, Callisto, Europa and Ganymede)

At 5:30, just before sun-up, Mercury will rise dead East and be up until the Sun appears just behind it at around 5:45

There it is... a complete tour of our wonderful Solar System all in 12 hours. I'm doin' it! Who's with me?????

All the planets, the Sun and 6 Moons Oct 8

By Alex Vrenios, PAS Member

So, all the planets, the Sun and 6 moons? This sounds like fun.

Saturn: At 6:30 PM, Diane and I set up the telescope and trained in on what we thought was Saturn. It turned out not to be Saturn, so we choose another bright "star" to view. That one wasn't Saturn, either.

The "scope," by the way, was a Celestron 5" SCT mounted on a photo tripod with a ball head, which is not the sturdiest arrangement. Each time we switched targets, it was chaos trying to center the object in the eyepiece. Enough of that nonsense...

We put all that away and brought out the 11" SCT, went through the alignment process, punched in "Saturn" and there it was! With a slightly higher powered eyepiece, we spotted Titan, confirming its location relative to Saturn against the Starry Night image. We logged Saturn and Titan at 7:05PM.

Pluto: We punched in "Pluto" and, while I'm sure it was there - somewhere, I could not match the star patterns to my

chart so I can't claim to have seen it.

Break time: We spent the next two hours eating supper and finishing a movie we had started a couple of days ago.

Neptune: Neptune was all alone in our urban sky. A small, pretty blue dot. We logged it at 9:10PM

Uranus: This was almost anticlimactic. I'm certain what we saw was Uranus, but it didn't look much different from the surrounding stars. We confirmed the star pattern with Starry Night and logged Uranus at 9:20PM. Time to watch a little TV and hit the sack...Robby, our dog, eats at 5AM so we're up anyway. At 4AM there was a shelf of clouds that obscured everything from the eastern horizon up to just below Venus - bummer! By 5AM, however, the clouds were gone and the pattern of stars and planets were piercingly bright. We looked up in awe at Orion and the rare conjunction of stars and planets. Quite a sight.

Moon: The Moon was a very thin crescent, it's most beautiful phase, in my opin-

ion. Earthshine was an added bonus.

Venus: Brilliant Venus was unmistakable. we logged the Moon and Venus at 5:00AM.

Jupiter: Not as bright as Venus, but its Galilean Moons (4 Moons) made it a lot more interesting. Logged at 5:05AM.

Mars: In binoculars or a backyard telescope, it's an orange dot. (No sign of Matt Damon.) Logged at 5:10AM.

Mercury: We took our binoculars to a place near us with a good view of the eastern horizon. Mercury sparkled as it peaked out from behind a thin dark horizontal cloud. We logged Mercury at 5:25AM.

Sun: The Sun came up about an hour after we logged Mercury. We logged the Sun at 6:35AM.

Earth: After all that it was good to be home again. Logged Earth at 6:45AM.

So, there you have it. The Sun, eight planets and six moons. All in under twelve hours. Thanks, Kevin, for the challenge!

Scouts at Cochise School Oct 21

By Sam Insana

Attending from PAS were Don Boyd and Mike Marron along with me. We provided 2 scopes and Meteorites for about 75 Scouts and Adults. The weather turned out to be decent, though at the end of the night, sprinklers went off and my eyepieces and cardboard boxes got wet. Luckily Don and I got our scopes out of the way before they got wet. I think what happened is that Alan thought we would set up on the sidewalk where there are no sprinklers but because it

looked like rain, I set up my scope under a ramada for protection. Ironically, the grass under the ramada had sprinklers. We showed the Moon and Saturn and Mike showed his meteorites during the one-hour event.



Don Boyd with his scope at Cochise School on Oct 21 2015. Photo by Sam Insana.



Mike Marron with his Meteorites at Cochise School in Scottsdale for a Cub Scout meeting on Oct 21 2015. Photo by Sam Insana.

Astro Tech - The Equation of Time, Part 2 of 2

By Alex Vrenios

(Continued from December 2015 PAStimes)

Last month we defined the concept of Clock Noon, the time of day that you expect the Sun to be at its highest point in the sky. Next, the concept of Local Noon was defined as the time of day when the Sun actually is at its highest point in the sky. We stated that these two times of day are almost always just a little bit different, due to the Earth's tilted axis and it's slightly elliptical orbit around the Sun. Finally, we presented an apparatus to help us collect data we can use to plot the Equation of Time (EoT) curve. (See The Equation of Time - Part 1, PAStimes, Dec 2015)

When you have collected a year's worth of data points, the sheet of paper inside the apparatus ought to look something like Figure 1. Our next task is to enter

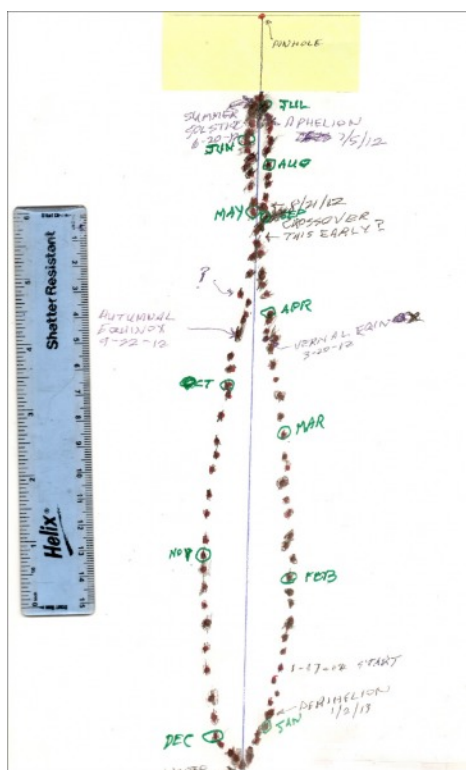


Figure 1. A year's worth of raw data points

the coordinates of these data points into a spreadsheet for processing. We will convert each data point to an altitude and azimuth of the Sun's location in the sky when the data was taken. Finally, we will plot our data-driven EoT curve and compare it to what the Analemma Society (analemma.org) claims as the correct version. In so doing, we hope to get an insight into how our Earth-Sun system behaves.

Note that when the Sun is high overhead, the corresponding point inside the box is close to the front and when the Sun is west of true south, the data point is left of center, i.e. the data points are flipped about the vertical and the horizontal from the corresponding positions of the Sun in the sky. The points left or right of center have a displacement angle that can be calculated. This angle is converted to an offset from true south to get the corresponding Sun position's azimuth angle. (The diagram in Figure 2 may be of some help understanding these relationships.) Our task is to project the data onto their altitude-azimuth

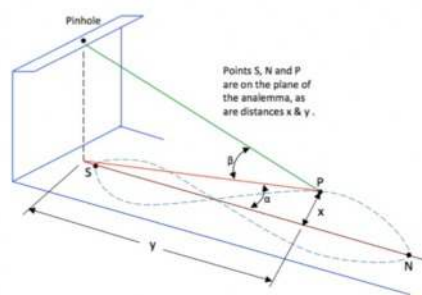


Figure 2. Data point relationships inside apparatus

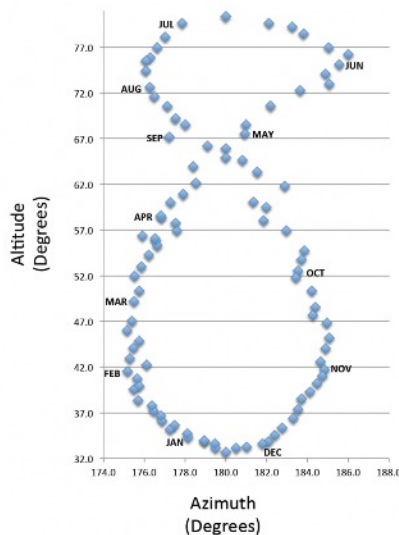


Figure 3. The converted data points

locations in the sky. Such a plot is shown in Figure 3. (Note that the distorted section in the upper right-hand corner of the plot may represent an apparatus alignment error.)

If the Sun takes an hour to move between two lines of longitude that are 15 degrees apart, the Sun is moving 1 degree every four minutes. The azimuth angle of the Sun's position in the sky at Clock Noon

can be converted to minutes of time between Clock Noon and Local Noon, where negative time means the Sun is late, or east of true south.

$$(\text{Azimuth}-180) / 4 = \text{Time}$$

A plot of each data point with the ap-

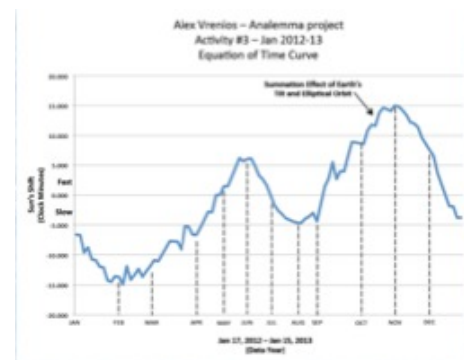


Figure 4. Equation of Time curve from processed data

proximate dates of acquisition along the X-axis, and the number of minutes before (+) or after (-) Clock Noon along the Y-axis should look something like the plot in Figure 4. Note that the number of data points taken each month varies slightly from month to month, due to weather, vacation time and personal scheduling conflicts. This gives our plot a slight distortion along the horizontal (Time) axis. The fact that we have only one year's worth of data, as opposed to an average of many decades' worth, gives our plot a choppy appearance when compared to the official curve. Finally, note that the official curve shows more than one year's worth of data. (Figure 5.)

Considering the crude apparatus and possible alignment issues, our data-driven curve looks a lot like the official version.

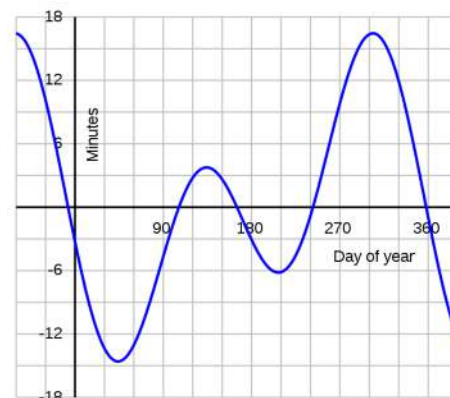


Figure 5. The accepted Equation of Time curve



How will we finally image the event horizon of a black hole?

By Ethan Siegel

One hundred years ago, Albert Einstein first put forth his theory of General Relativity, which laid out the relationship between spacetime and the matter and energy present within it. While it successfully recovered Newtonian gravity and predicted the additional precession of Mercury's orbit, the only exact solution that Einstein himself discovered was the trivial one: that for completely empty space. Less than two months after releasing his theory, however, the German scientist Karl Schwarzschild provided a true exact solution, that of a massive, infinitely dense object, a *black hole*.

One of the curious things that popped out of Schwarzschild's solution was the existence of an event horizon, or a region of space that was so severely curved that nothing, not even light, could escape from it. The size of this event horizon would be directly proportional to the mass of the black hole. A black hole the mass of Earth

would have an event horizon less than a centimeter in radius; a black hole the mass of the sun would have an event horizon just a few kilometers in radius; and a supermassive black hole would have an event horizon the size of a planetary orbit.

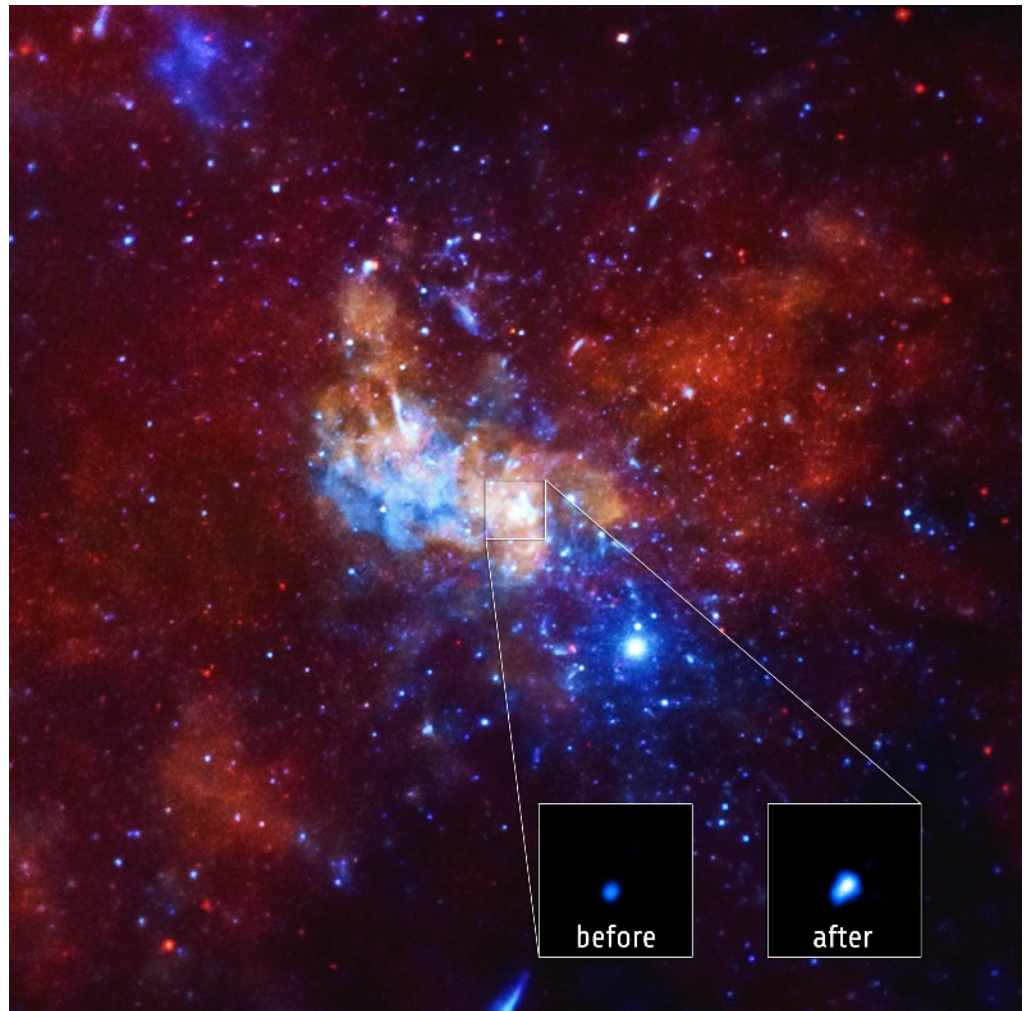
Our galaxy has since been discovered to house a black hole about four million solar masses in size, with an event horizon about 23.6 million kilometers across, or about 40 percent the size of Mercury's orbit around the sun. At a distance of 26,000 light years, it's the largest event horizon in angular size visible from Earth, but at just 19 *micro*-arc-seconds, it would take a telescope the size of Earth to resolve it – a practical impossibility.

But all hope isn't lost! If instead of a single telescope, we built an *array* of telescopes located all over Earth, we could simultaneously image the galactic center, and use the technique of VLBI (very long-

baseline interferometry) to resolve the black hole's event horizon. The array would only have the light-gathering power of the individual telescopes, meaning the black hole (in the radio) will appear very faint, but they can obtain the resolution of a telescope that's the distance between the farthest telescopes in the array! The planned Event Horizon Telescope, spanning four different continents (including Antarctica), should be able to resolve under 10 *micro*-arc-seconds, imaging a black hole directly for the first time and answering the question of whether or not they truly contain an event horizon. What began as a mere mathematical solution is now just a few years away from being observed and known for certain!

Note: This month's article describes a project that is not related to NASA and does not suggest any relationship or endorsement. Its coverage is for general interest and educational purposes.

Image credit: NASA/CXC/Amherst College/D.Haggard et al., of the galactic center in X-rays. Sagittarius A is the supermassive black hole at our Milky Way's center, which normally emits X-ray light of a particular brightness. However, 2013 saw a flare increase its luminosity by a factor of many hundreds, as the black hole devoured matter. The event horizon has yet to be revealed.*



Are your dues for 2016, past due?

A quick reminder that your 2016 dues were due by Dec 31, 2015.

By Terri, Event Manager

The PAS year runs from January to December, but we start asking our members to renew their membership in September.

If you are a current member of PAS, your membership officially ends December 31. This year, there is no extension; at the beginning of January, those who have not renewed will be removed from the PAS website and the PAS Roster, so be sure to update your membership with Eric or Terri. If you are unsure of your status, pop into the Roster at this link in the Member's

Download section: <http://www.pasaz.org/forums/downloads.php?do=file&id=48> to see if your membership shows you are current through 2016 (right side of document). If not, please consider renewing your membership, and soon. Also, PAStimes Star Tour members must be current before December 31 to receive compensation for helping at a paid event. Convenient ways to pay include: bringing a check (strongly preferred) or cash to a meeting to give to Eric or Terri (be sure to get a receipt), or sending a check with your

membership form to the PAS Mailbox (you will get an email receipt). Be sure your membership form shows "2016" at the top of the page, as no other dated membership forms will be accepted. The PAS Dues Sheet / Membership Form is at this link: <http://www.pasaz.org/forums/downloads.php?do=file&id=129>. The updated version (2016) is available now.

Can't get into the Private access of PASaz.org? Only current Members have access. Renew your Membership today!

Scope For Sale

Meade LX200GPS 12" Schmidt Cassegrain Telescope Package.

Astronomical items and telescope for sale preferably as a package. Items may have been set up or opened, but only to visually inspect them and possibly fit them together to learn about how to set the telescope and accessories up. As a result the items are all in new or like new condition. Unfortunately this scope has never been under the stars. :-(

Package Includes: Meade 12" LX200 GPS SCT (original box with packing foam, user manual), Heavy Duty Tripod with Equatorial Wedge, Meade 8x50 viewfinder with rubber cover, JMI 2-wheeled Telescope Hard Case with handles, Meade Zero Image Shift Electronic Micro Focuser

(07080), Meade Series 4000 26mm Super Plossl Eyepiece (07175), Meade 9mm Plossl Illuminated Reticle with power cord (07068), Meade UHTC 2" Star Diagonal (07222), Meade USB to RS232 Adapter Cable, Meade #404 Connector Cable Set, GoSky 12.5mm Illuminated Eyepiece with many extra batteries, Meade Color Filter Set #1 (07530) [#12, #23A, #58, and #80A), Meade Vari-Cam Adapter A-size (07361), Meade 25' Extension Cord (07043), Meade Piggyback Bracket (07399), Meade Vibration Isolation Pads (07368), Meade Series 5000 1.25" TeleXtender (2X) (07670), Meade LX200 Power Supply (07577), ScopeTronix MaxView 2.0" DSLR Adapter, Peterson Engineering Mounting Assistant (new, uninstalled), Pe-

terson Engineering EZ Clutch Kit (new, uninstalled), Peterson Engineering EZ Focus Kit (new, uninstalled), Buck's Precision Gears (new, uninstalled), Scopestuff Rusty Screw Replacement Kit (new, uninstalled), Scopestuff LX200 Collimation Thumbscrew Kit (new, uninstalled), Aluminum Accessory Case on 2 Wheels with Handle for Easy Transport 20"x14"x8", and Autostar Suite Software. Here's the link with some photos of this equipment: <http://www.pasaz.org/forums/download...do=file&id=259>

Asking \$3,200.00 for everything listed here. Contact PAS Member Bill Powell by email: wrpowell2002@yahoo.com

Scope for Sale

Nexstar 9.25 carbon fiber - Fastar Compatible. Asking price is \$1,500 for the package which includes: Eyepieces: 4mm, 6mm, 9mm, 15mm, 32mm, 40mm, a 2x Barlow lens; Filters: No. 21 orange, No. 25

red, No. 12 yellow, No. 80a light blue, No. 58a dark green, No. 56 light green. Also included is a red clip on light. Please contact: Terry Tmranger86@gmail.com or (602)-703-3772. View photos of this scope

and accessories at this link: <https://www.dropbox.com/sh/19ak53vbuwujupu/AABr2UwkkbaPxIRaJsEQyuMYa?dl=0>

Dec 2 Review

Continued from page 1

cember, Howard mentioned the Binocular Telescope field trip, Alex mentioned the comet and occultation of Dec 7 and finally we had the raffle drawing. I wish to thank Storm Sallas for helping with the raffle, won by Paul Facuna. I'd also like to thank

Sam for the popcorn, and everyone else who brought snacks to share. Many thanks to all the PAS Members who helped with set up, cleaning, putting things away and picking up after the people who dropped food. We have to get permission from our

liaison to have food, and careful cleanup is helpful to PVCC and for us to maintain a room to meet in. Please help with that. See you at the next meeting!

Special Voting Meeting of the Minds Jan 27

Written by Terri Finch, Event Manager

This is a private members-only meeting to vote on the changes to the PAS bylaws (no guests or friends allowed other than adult family members living in your household). Your attendance is requested. Please see the website at this link:

<http://www.pasaz.org/forums/calendar.php?do=getinfo&e=1848&day=2015-1-28> for the room number and time and to RSVP your attendance. Please also read about the items to be voted on. Bring a fun snack to share. Water will be provided by PAS Snack Fund. See you there.

President Sam Insana writes: Here are the proposed bylaw changes that were considered by the PAS Board of Directors. Pursuant to Article 5 c of our Bylaws.

Proposed PAS Bylaw changes to be voted on at the MOM on January 27, 2016

Sam Insana, PAS President, proposes:

Article 2a President: Add the following 3 sentences after the first sentence following the word "document." "The President is responsible for overall supervision of all functions of the Society. The President presides at Board of Director meetings. The President has general signature authority on behalf of the Society."

Also, capitalize the word "President" in the last sentence of Article 2a. Also add the word "Society" after the word "all" and before the word "meetings" in line one of the Article 2a

Kevin Witts, PAS Secretary, proposes:

Add the Secretary role to the list of officers with accompanying description: The Secretary shall record and publish minutes of all Meetings of the Mind and obtain subsequent approval of those minutes. The Secretary will also create and provide agen-

das for all Society regular meetings. The Secretary serves as a public relations liaison with local media for all applicable Society events. The Secretary ensures that an up-to-date copy of the bylaws is available at all meetings and serves as a resource for the interpretation of those bylaws. The secretary will then amend and upload all approved changes to the bylaws. The Secretary serves as one of the signing officers for certain documents. In this capacity, the Secretary may be authorized or required to sign or countersign checks, correspondence, applications, reports, contracts, or other documents on behalf of the Society. The Secretary is responsible for maintaining accurate, up-to-date role descriptions and responsibilities for the officers of the Society. The Secretary certifies that the results of all elections are accurate and authentic. The Secretary may also initiate an email balloting process if necessary should timeliness of a voting motion prohibit an official member gathering.

Alex Vrenios, PAS Member at Large, proposes:

Article 1b: The membership form should not be the same as the Bylaws:

Form: Regular (annual single or family dues).

Student or Senior (reduced dues of \$10), or

Life (fixed, one-time payment).

Bylaws: Regular (includes Student, Senior, Single, Family and Life)

Suggested addition to the end of paragraph 1 a: "Students must present a valid student ID." Senior members must be at least 62 years of age"

Suggested rewrite of 1 b 1: "Regular Memberships, consisting of Student, Senior, Single, Family and Lifetime member-

ships,"

Sustaining (as currently described in 1b2 of the Bylaws),

Honorary (as currently described in 1b3 of the Bylaws)

Special (as currently described in 1b4 of the Bylaws, like our webmaster, e.g.)

Rationale: The membership form allows a prospective member to choose a membership category, considering his or her age and student/marital status. By checking a box on the form they are saying at what level they want to join or renew. Students must present a valid student ID (Accept a senior's word.)

Article 2c: Treasurer should be 2d and the description of Secretary should be added as 2c with the Astronomical League responsibilities added to what Kevin wrote up earlier.

(Sam proposes change Editor to 2e, Host to 2f, Past President to 2g and Board of Directors to 2h)

Alex proposes: Change Article 2f Host and or Hostess from "assign name tags" to "request sign in"

Article 2 h: Change "either six (6) or eight (8)" to "nine (9)" President, Vice President, Secretary, Treasurer, Editor, Host or Hostess, Past President are 7, plus 2 Members at Large make 9

Article 3 d: (The succession should agree with the order they are presented in Article 2, such as ...Secretary, Treasurer...)

Article 4 a: Add a sentence to the end of this paragraph as follows: "Managers may be granted Special Membership according to Article 1 b subparagraph 4" (Our webmaster, for example, as a manager, had his membership fee waived by vote)

Apache Elementary Star Party Nov 6

By Earl DeLong

The weather was nice. We set up in a convenient and nice location. There was a lot of foot traffic by our telescopes. The lights from the football field were turned off around 7pm. Nice school, nice staff, interested and polite students and parents. Surprisingly dark sky for this area. Good night with approximately 100 observers

looking through my telescope (Alberio, Double Cluster, Andromeda Galaxy, NGC 905). I would return to this location.

This school event was very filled with activities for the attendees. Photo provided by Sam Insana.



Lunar Eclipse Party at Coyote Basin Park Sept 27

By Kevin Witts, PAS Secretary

By Terri Finch, Event Manager

A HUGE crowd showed up for the PAS Lunar Eclipse Viewing Party on Sunday, September 28th. The event was announced on ABC15.com and AZ Family.com, as well as Meetup and the PAS website. Approximately 600 people armed with blankets, lawn chairs, cameras and personal telescopes descended on Coyote Basin Park in North Phoenix and spread out along a grassy, sloped hill to watch the rare "Super, Blood Moon" do its thing.

The Moon certainly did not disappoint, rising in a partially eclipsed state over the McDowell Mountains to the east of Phoenix. Members of the crowd gasped and scrambled for cameras as the huge orb crept slowly from the horizon, showing a small crescent of shadow as it rose.

PAS astronomers offered views through their scopes throughout the night and the PAS information table offered information about how eclipses work and why the moon turns its reddish color.

As the Penumbra and Umbra progressed across the Moon's surface, photographers and astronomers were able to see stars along the whole perimeter and even captured some aircraft crossing directly in front of the disc.

The event concluded when the last of the red color left the Moon and only a piece of the dark crescent remained. The crowd seemed to really enjoy the event as several comments and social media posts indicated that this was a once-in-a-lifetime event that was enhanced by the availability of the telescopes and the knowledge of the PAS team.

In attendance from PAS were: Alex Vrenios with a camera, Dewell and Wendy Howell with his 12" dob, Sam Insana with his 8" scope, Peter Turner with his 9.25" scope, with a cell phone mount for photography and Mike Marron (under a light pole) with his meteorites. Mike (assisted by Rodney), of course had a crowd all night long. William Finch was at the PAS Table with me, working the Astroscan while I did a sign up, membership drive, some Q&A and handouts. Old friend and ex-PAS member Andrew Lewton brought an ETX90, which he set up on the PAS Table, too. Paul Facuna assisted, Howard Moneta and his mom Daneilan brought his 8" scope, and Tina Atherton helped with the PAS table. Finally Kevin Witts was there, doing handouts (thanks, Kevin), and hanging out with Thomas Bopp. It was great to see Thomas again - I took him around to meet the new officers of PAS.

Here's a cool video my friend Sue Thiebes provided to me that explains how Eclipses work. Enjoy!
https://m.youtube.com/watch?utm_campaign=buffer&utm_source=facebook.com&utm_medium=social&v=YwZjQwx5Xo&utm_content=buffer05c34

Elizabeth, from MeetUp (MU), writes: Awesome event with lots of great people!!!

Taha (MU) writes: I thoroughly enjoyed it! Clear skies and lots of friendly people sharing their telescopes with beautiful views of the eclipse.

Lucia (MU) writes: Awesome! Great turnout to view such an amazing eclipse!

Gari (MU) writes: Spectacular evening! I look forward to going to more events, Thank you Howard for putting this together and letting me look through that cool telescope! Great eclipse!

Isabel (MU) writes: Excellent!! Super knowledgeable and nice! Thank you!!

After the event, the team chose to do dinner at Upper Crust Pizza. They held a very nice Birthday party for me. At dinner were Howard, Kevin, Sam, Vera, Paul, Rodney, Alex, Diane, William and me. Thank you all for the great party!



At the Lunar Eclipse of Sept 27 at Coyote Basin Park, we see the Moon rising in the East above Sam's head. The crowd was 1500+. Photo by Terri



The crowd gathers with blankets, binoculars, friends & family as the Moon begins to eclipse. William is standing by the PAS table, Peter is just beyond him. There are 6 telescopes & Mike with his Meteorites at this event. Photo by Terri.



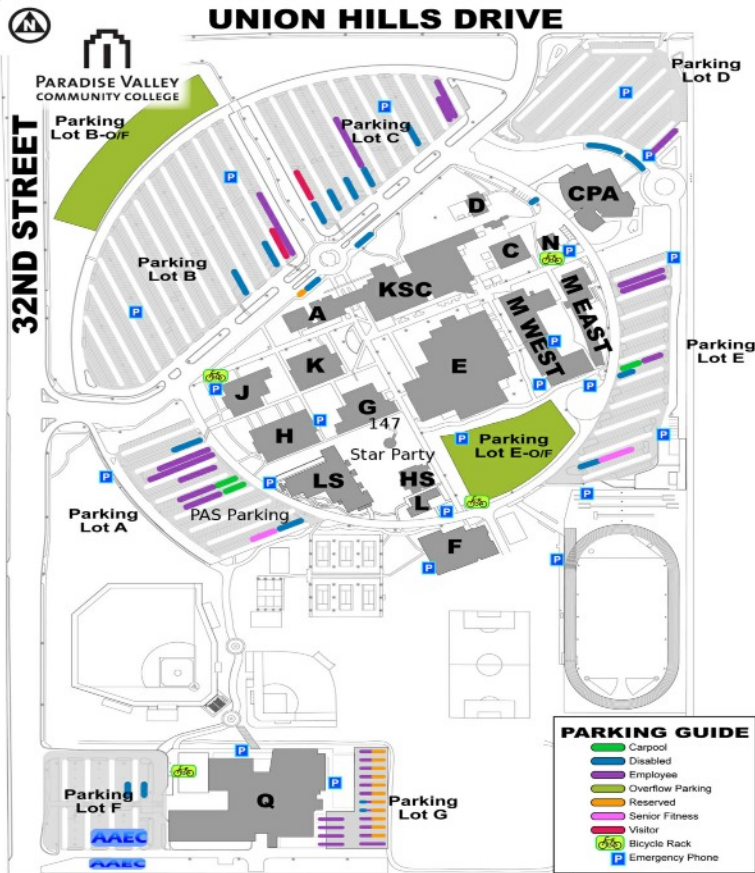
This photo of the Lunar Eclipse of Sept 27 2015 came out awesome! It was provided to me by my good friend Sue Thiebes. This Crescent is exposed perfectly for this photo.



Photo of this Total Lunar Eclipse of Sept 27 2015 was provided by a friend of Sue Thiebes. Sue writes: A friend posted these 2 photos on Facebook, so I sent them your way, they're hilarious, thought you would appreciate them!

Map of PVCC Main Location

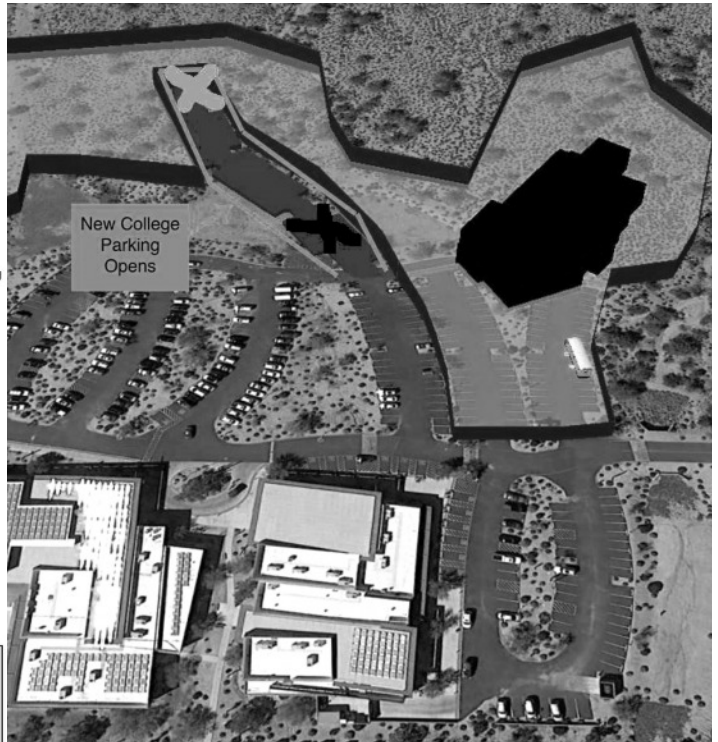
18401 N. 32nd Street | Phoenix, AZ 85032



Black Mountain Campus of PVCC

60th Street and Carefree Hwy

34250 North 60th Street, Scottsdale, AZ 85266



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

January 2016

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14 PAS Meeting	15 School Star Party (Private)	16 PAS Music Jam
17	18	19	20	21 Free Telescope Workshop	22	23
24 Free Telescope Workshop	25	26	27 PAS Private Meeting 2	28 School Star Parties (Private)	29 Solar Viewing at BMC	30 PAS Annual Social (Private)

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Don Boyd
PAStimes Editor
3039 W Peoria Ave 102-188
Phoenix AZ 85029

To:

2015 PAS GUEST SPEAKER LINE-UP

By Terri, Event Coordinator, Events@pasaz.org

These meetings are held on Thursdays in Room LS-204, unless otherwise noted.

Do you have an idea for a Guest Speaker? Email me the details. Here are the scheduled Guest Speakers at PAS:

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

Feb 4: Ted Blank: "Getting Started as a 'Citizen Scientist' with Occultation Timing"

Feb 25: Special Meeting with Guest Speakers

Mar 3: David Williams: "Year of the Dwarf Planet: Dawn at Ceres and new Horizons at Pluto"

Apr 7: Elliott Rachlin "Usefulness of a Telescope Mounted on the International Space Station"

Follow PAS on:

Twitter - <https://twitter.com/PASevents>

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

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

What's Up For January?

By Rod Sutter, PAS Past President

Planets

Name	Date	Rise	Set
Mercury	01-15-15	07:12	17:34
Venus	01-15-15	05:05	15:34
Mars	01-15-15	01:40	13:38
Jupiter	01-15-15	10:11	10:39
Saturn	01-15-15	04:31	14:40
Uranus	01-15-15	11:30	12:13
Neptune	01-15-15	09:51	21:05
Pluto	01-15-15	06:50	17:00

All Times Arizona Time

January 15 2015

Sunrise: 07:32

Sunset: 17:40



Q3: January 1



New: January 9



Q1: January 16



Full: January 23

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