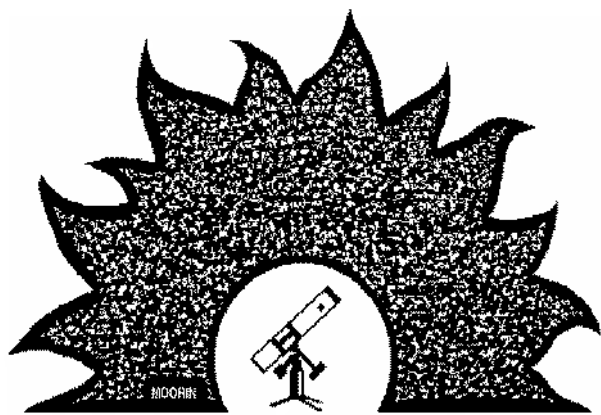




PAStimes

Phoenix Astronomical Society

www.pasaz.org

April 2017

Volume 68 Issue 8

PHOENIX ASTRONOMICAL SOCIETY — ESTABLISHED 1948

Harrison Smith to talk at April 6 Meeting

Data received from Harrison.

“The Search for Life on Other Worlds”

“Earth-sized planets seem to be popping up everywhere—from our nearest stellar neighbor Proxima-Centauri, to the seven recently discovered planets crowding the star TRAPPIST-1. The sheer number of planets discovered which share physical similarities to Earth begs the questions: Could any of these worlds support life? Might any of these planets contain living beings? While the search for life on exoplanets is just beginning, the search for life on planets in our own solar system has been under way since the Viking landers touched down on Mars in 1976. The Viking missions did not find conclusive evidence of extraterrestrial life, but we have continued to send spacecraft to Mars in hopes of finding evidence of past life. This search for life on Mars differs considerably from the search for life on exoplanets, where researchers have much less data on each planet. This talk will highlight the latest approaches that researchers are taking to search for life outside the solar system, and how this compares to the search for life

inside the solar system. Along the way, we will think about what life is, what life does, and how we can use this to help distinguish life from a non-living environment.

Harrison B. Smith is a PhD Candidate in the School of Earth and Space Exploration at Arizona State University (ASU). His research is broadly concerned with understanding the origin and evolution of life on Earth, with a focus on how different scales of biology interact—from individuals, to ecosystems, to the biosphere as a whole. He is also investigating new approaches to looking for life on exoplanets. Before coming to ASU, Harrison worked as a cubesat engineer in the Mission Design Division at NASA Ames Research Center. He received his BS in Physics and Astronomy/Astrophysics from the University of Michigan, where he also helped develop new instrumentation for cosmology research.”

Please join PAS in welcoming Harrison as our guest speaker for this month. Meeting room opens at 7pm, with setup and snacks (don’t forget to donate to the snack

fund) until the meeting begins at 7:30pm. We open with a few very brief announcements before our guest speaker takes over. Everyone is welcome - bring a friend!

Also, please RSVP by the day before if you wish to join us at Chili’s before the meeting. The link to RSVP is: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2281&day=2017-4-6&c=1>. Everyone is welcome. If you’re not a member, this link won’t work, so just drop me an email at Events@pasaz.org to say you are attending.



Harrison will be our Guest Speaker for the April 6 PAS Meeting. Come have dinner before the meeting and meet this fantastic Guest Speaker! Photo provided by Harrison.

PAS Meeting March 2nd

By Terri, Event Manager

At the March 2nd meeting, we had a great guest speaker, Andy O’Dell, who brought to PAS an excellent presentation on the “Life of Stars”, covering formation, main sequence and end stages of stellar evolution. Many thanks to Andy for the fantastic presentation. We hope to schedule a return visit.

We had 24 in attendance at this meeting. The raffle this month was won by the

guest speaker and donated back to PAS. Thank you Andy. Thanks to everyone who provided snacks to share and for your donations to the snack fund which will provide next month’s case of water.

Prior to the meeting, 8 PAS Members and Andy met at Applebee’s to enjoy dinner.

We are looking forward to April’s dinner prior to the meeting which will be at

Chili’s. Come join us for “Dinner & Meet the Guest Speaker” on April 6th.



Andy O’Dell shared with the attendees of the Mar 2 meeting, a very HOT topic of “Stellar Evolution.” Photo by Don Boyd.

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PAS Upcoming April Events

By Terri, Event Manager

Check out these and other fun events on the PAS Calendar: <http://www.pasaz.org/forums/calendar.php>. RSVP where requested to Events@pasaz.org. On the PAS Calendar, "Private" means it is for PAS members only or PAS SIG Members.

Apr 1: Field Trip to ASU (Private). More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2309&day=2017-4-1&c=1>

Apr 3: School Star Party (Private)

Apr 4: Spectroscopy Meeting (Private). More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2313&day=2017-4-4&c=1>

Apr 6: Dinner prior to the PAS Meeting will be at Chili's at 4:30pm. Come meet the guest speaker - everyone is welcome. RSVP is required by the day before at this link: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2281&day=2017-4-6&c=1>

Apr 6: PAS Meeting at PVCC in Room LS 203. Come enjoy a presentation by Harrison Smith. 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=2009&day=2017-4-6&c=1>

Apr 8: Public star party at Bookmans for a sidewalk astronomy event. Event is from 7pm to 10pm and RSVP is requested. Come view through our telescopes to see the Moon, Jupiter and more. More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2233&day=2017-4-8&c=1>

Apr 9: 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 number 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=2020&day=2017-4-9&c=1>

Apr 13: 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 number of your telescope. Bring your telescope and accessories to this event. We meet in both 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=2016&day=2017-4-13&c=1>

Apr 15: PAS Social (Private). This is the Party of the Year!!! Read up about this event in the January 2017 edition on page 7 at this link: <http://www.pasaz.org/PAStimes/2016/2017/2017-01.pdf>. Due to a storm, the date in January canceled and rescheduled to this date but the fun continues! RSVP is required - this is a PAS members and their immediate family members only event. <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2274&day=2017-4-15&c=1>

Apr 20: Huge public star party at

PVCC Black Mountain Campus, 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. Highlights: Jupiter, Orion Nebula, and Mars. More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2092&day=2017-4-20&c=1>

Apr 22: Spring Binocular Star Party (Private), PAS Members and their immediate family members only. Highlights: Lyrids Meteor Shower, Jupiter, Orion Nebula and Mars. More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2185&day=2017-4-22&c=1>

Apr 27: PAS Awards Ceremony - Members Appreciation Pizza Party (Private) PAS Members only. RSVP is required and you must wear your name badge to this event. More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2162&day=2017-4-27&c=1>

Apr 28: School Star Party (Private) Backup date

Apr 29: Astronomy Day - Everyone welcome in Heritage Square by the Arizona Science Center in Phoenix from 10am to 9pm. Solar viewing, meteorites, evening viewing and more. Highlights: Moon, Jupiter, and Orion Nebula. More details: <http://www.pasaz.org/forums/calendar.php?do=getinfo&e=2150&day=2017-4-29&c=1> RSVP requested.

Meeting of the Minds Mar 21

By Terri, Event Manager

On Mar 21, PAS held a members-only Meeting of the Minds. In attendance were Don Boyd, Sam Insana, Bill Powell, William and Terri Finch, Rodney Fong, Ted Blank, Kevin Witts, Alex Vrenios, Mike Marron, Bruce, Ed and Bette Wurst. Thank you all for attending and discussing the following PAS business issues:

Approval of the prior MOM Minutes from Jan 5, 2017.

Spending or investing PAS cash - this topic is added to the next MOM's Agenda since Eric, PAS Treasurer, was not in attendance to share his research in this matter.

Diversity of PAS Membership - a nice discussion was had about this topic with

several ideas shared among the attendees.

Website upgrade Committee Progress - discussion and ideas shared. Bill Powell gave a progress report and asked for volunteers to help.

Mentoring Program - Sam shared his ideas on offering this program to any PAS member who feels they need additional help.

Awards Ceremony - discussion took place on what awards to have PAS provide at this year's Ceremony.

Astronomy day at ASC - plans for Apr 29.

Joe Collins' Membership status - it was decided to give Joe continued Honor-

ary Membership for now even though his Honorary Membership was contingent on continued events at CTCA (which have recently ended).

PAS Memberships - Discussion about how new members are processed into PAS along with the possibility of having Alex take over the welcoming of new members from Terri. A flowchart was drawn to show the process.

This was a very productive meeting. The next PAS members-only Meeting of the Minds is planned to be scheduled sometime during the Summer of 2017 and will be held at Mike's house. Please watch for that announcement.

Planning for the May 11th PAS Elections

By Terri, Event Manager

For the May issue of our newsletter, I think it would be great to get some info on who would like to run for an officer position within PAS for next year. If you are interested in changing position, taking a position, or maybe a directorship, please write a little about yourself and why you feel you can fill that position, and send it to me for the May issue of the newsletter. The deadline will be April 1st. And NO, this is NOT a joke, just in case April 1st meant something to you. :)

Send them over. Let's see if we can get some interested PAS members to be our Officers for this next year. Here's a list of the positions you might consider taking:

President - Currently Sam, but Sam has requested to step down from this position, so a new President is needed.

Vice President - Currently that is Alex. I haven't heard if he wants to keep his position or give it up. Maybe he will write something for the newsletter letting every-

one know why he wants to keep the Vice President position for one more year.

Editor - Currently this is Don and he is doing a super job of being Editor, however, I know he would be willing to let someone take this position from him.

Meeting Host - Rodney is our current Meeting Host and doing a spectacular job of that position.

Treasurer - Currently Eric who would like to keep the position for another year.

Secretary - Kevin is our Secretary and has been doing a fine job of the many facets that come along with this position. I haven't heard from him either, as to if he wants to pass this position on to anyone, but if you are interested in the position of Secretary, I'm sure we can work something out.

Someone suggested a Co-President position, but we would have to vote on this before it can become a position within PAS and then add it to the By-laws. But, I like

the idea. Why not have a position to help the President, as that is a challenging position to fill.

For directors we have:

Members at Large

Currently: Bruce is one of the Members at Large and he has one more year to his term.

And Jenny is the other MAL and she can choose to take it again or give up the position to someone else.

Event Manager is a directorship currently and Terri has that position (yea, that's me). I don't think anyone wants my position.

That covers our main Officer/Director positions that will be voted on at the May 11th meeting. So, if you wish to run for one of these positions, send a nice little paragraph my way for the newsletter so everyone can read about you and consider you for the position.

The Star Barn Planetarium Show Feb 26

By President Sam Insana

On Sunday, Paul Facuna, Frank Insana, Sam Insana, Mike Marron and Ofelia Waters attended the planetarium show at the Star Barn in Cave Creek. Ron Walker, the host of the show, was very entertaining as usual. He spent about 30 minutes showing what is up in the night sky and then showed photos taken by the Hubble Space

Telescope for almost an hour. There were over a dozen other members of the public attending. If you haven't been to one of Ron's planetarium shows, please try to attend one of these free shows. They are on Saturday and Sunday afternoons. This event is open to PAS Members only.

Terri adds: Here are some of the

March Planetariums shows: The "Seasons/Calendar" show will be presented on Saturday March 25th at 1 and 3 pm, as well as Sunday March 26th at 1 pm. For more details visit this link in the Private Forums:

<http://www.pasaz.org/forums/showthread.php?t=878>

PRESIDENT'S CORNER

By President Sam Insana



PAS President Sam Insana. Photo by Terri

Most of us at PAS take pride in our public outreach programs where we show the night sky to others with our telescopes. It does not have to stop there. We can each become multitasked with regard to astronomy and the public. Some of our PAS members also display and talk about meteorites. Others use a laser pointer to show the different constellations. Still others use astronomy PowerPoint discussions in a lecture setting.

Some teach the public how to use their telescopes at workshops. Others show the public how to find various objects using star charts, planispheres, setting circles and apps on smartphones.

PAS is already outstanding in public outreach programs among astronomy clubs. By each of us becoming multitasked, we can grow as astronomers and give the public an even greater experience.

Upcoming Fall 2017 Events with PAS

By Terri, Event Manager

Calendar:

<http://www.pasaz.org/forums/calendar.php>

For all PAS events, please make sure to check the online calendar to be certain the events are happening, and drop an RSVP to Events@pasaz.org when requested to do so. Here is a list of PAS public events for this Fall that you may wish to put on your calendar. There are always more events being added to the calendar. Would

love to have you attend. Bring the whole family and your friends to these events!!!

Sept 7: PAS Meeting

Sept 10: Free Telescope Workshop

Sept 14: Huge Star Party at BMC

Sept 21: Free Telescope Workshop

Sept 30: Astronomy Day Star Party

Oct 5: PAS Meeting

Oct 8: Free Telescope Workshop

Oct 12: ASU West Star Party

Oct 19: Huge Star Party at BMC

Oct 26: Free Telescope Workshop

Nov 2: PAS Meeting

Nov 9: Huge Star Party at BMC

Nov 19: Free Telescope Workshop

Dec 7: PAS Meeting - Tentative

Viewing Comet 41P/TGK

By Sam Insana, President of PAS

At Mike's place in Carefree at the PAS Messier Marathon, I finally saw Comet 41P/TGK on the night of March 25th. It was in Ursa Major. The comet was faint

with no tail; I tried observing it by naked eye and with binos but needed my 8 inch Newtonian reflector (with an eyepiece that gave me about 46 magnification) for it to be

visible. It should brighten over the next few nights, but when the moon comes out, it will again be hard to see. Get away from city lights to see it.

What's Up For April?

By Rod Sutter
Planets

Name	Date	Rise	Set
Mercury	04-15-17	06:09	19:34
Venus	04-15-17	06:24	16:42
Mars	04-15-17	07:29	21:22
Jupiter	03-15-17	18:08	05:47
Saturn	04-15-17	11:39	09:43
Uranus	04-15-17	05:57	18:49
Neptune	04-15-17	04:09	15:34
Pluto	04-15-17	01:13	11:20

All Times Arizona Time
Bolded dates and times are nighttime objects

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April 15 2017

Sunrise: 05:57

Sunset: 18:59



Q1: April 3



Full: April 11



Q3: April 19



New: April 26

Product Review: SkySafari 5 Plus App for IOS and Android

By Mark Johnston

I use a Celestron CGEM mount and while it's solid and tracks well, I've never been happy with the alignment process (more about that later). My investigation led me to the SkySafari 5 App for iPhones and Androids.

Summary: if it's compatible with your mount, buy it. It's amazing.

The app comes in 3 versions:

	Free	Plus (\$15)	Pro (\$40)
# Stars	11 9K	2.6M	27M
# DSO's	220	31K	74 0K
Solar system objects	>50 0	18K	62 0K
Control of Telescope	No	Yes	Yes

Solar system objects include currently viewable comets, asteroids, planets and satellites. For example, last night I was able to quickly and easily go to Comet 2P/Encke and Ceres.

How it works: In order to use it with your telescope, you need a WiFi-enabled mount. The setup menu of the app lists dozens of compatible mounts from Celestron, Meade, iOptron, Vixen, Orion, AP, Losmandy, Takahashi, etc. However, like most mounts, my mount wasn't WiFi so I had to buy the Celestron SkyPortal WiFi adapter (\$89). This is a small dongle that plugs into the AUX port on my mount, takes power from the mount and acts as a local WiFi access point to which your phone connects.

Aligning the scope: Since the app knows the time and where you are, that part of the alignment process is eliminated. What I didn't like about the 'stock' CGEM alignment process is it made you use certain stars which weren't necessarily easy to find just after sunset (like Navi or Sheraton). With the App you just pick ANY two stars (or planets) visible in the east, then 2 in the west and you're done. I've spent 2 evenings with the app and it aligned quickly and easily and stayed aligned for the several

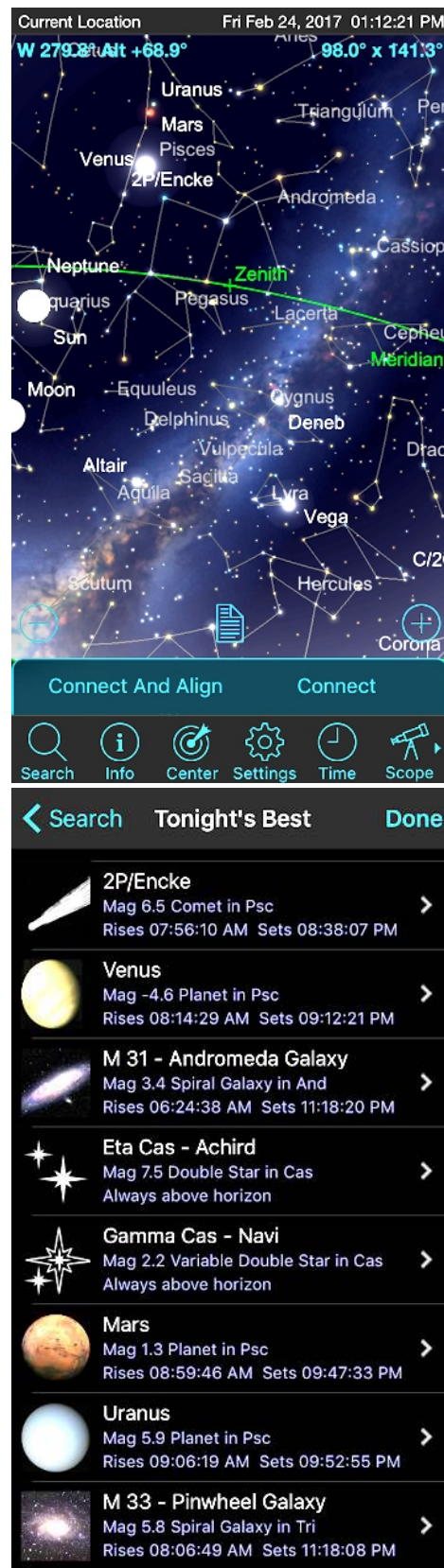
hours I spent observing.

Choosing objects: The app includes all the usual suspects: Planets, Messier objects, NGC, Caldwell, SAO, double stars catalogs but also includes asteroids, comets, asteroids, satellites (including Iridium flares), and "tonight's best" (example below). The sky is shown on your app and you simply touch the item you want to look at (or choose from a list) and press 'goto'. Presto, you're looking at Ceres. It's very easy and super cool. How often have you had someone ask you how far it is to a double star you're pointed at and you're stumped? Just press "Info" and see distance, spectral type, separation in arcseconds and AU and tons more data. I've also set up 12 custom lists (January best, February best, etc) based on my experience doing public outreach star parties.

My observing focus is solar system, double stars and star clusters, so for me, the "Plus" version has more than enough. If you're a serious fan of the faint fuzzies, then an extra \$15 to buy the "Pro" version might be warranted.

Want didn't I like? The documentation is terrible. The initial set up had me scratching my head for 45 minutes trying to figure out why the app would not connect to my CGEM mount. Turned out I needed to select "Celestron WiFi" and not "Celestron CGEM" for my mount type – kind of counter intuitive. Also it's a 'gloves off' situation, so using it when it's cold means you're going to have cold fingers. The other catch is the app uses an internet connection over your phone (3G or LTE) to learn time and location. If you were observing in a remote location without cellular data service, you would have to enter that information manually.

Overall I like that I can align sooner after sunset in process that's both quicker and more accurate. The goto function, especially with comets and asteroids is awesome. The info screens are really helpful in public environments and you can't underestimate the 'cool' factor of controlling your scope remotely from your phone. I highly recommend the product.





What It's Like on a TRAPPIST-1 Planet

By Marcus Woo

With seven Earth-sized planets that could harbor liquid water on their rocky, solid surfaces, the TRAPPIST-1 planetary system might feel familiar. Yet the system, recently studied by NASA's Spitzer Space Telescope, is unmistakably alien: compact enough to fit inside Mercury's orbit, and surrounds an ultra-cool dwarf star—not much bigger than Jupiter and much cooler than the sun.

If you stood on one of these worlds, the sky overhead would look quite different from our own. Depending on which planet you're on, the star would appear several times bigger than the sun. You would feel its warmth, but because it shines stronger in the infrared, it would appear disproportionately dim.

"It would be a sort of an orangish salmon color—basically close to the color of a low-wattage light bulb," says Robert Hurt, a visualization scientist for Caltech/IPAC, a NASA partner. Due to the lack of blue light from the star, the sky

would be bathed in a pastel, orange hue.

But that's only if you're on the light side of the planet. Because the worlds are so close to their star, they're tidally locked so that the same side faces the star at all times, like how the Man on the Moon always watches Earth. If you're on the planet's dark side, you'd be enveloped in perpetual darkness—maybe a good thing if you're an avid stargazer.

If you're on some of the farther planets, though, the dark side might be too cold to survive. But on some of the inner planets, the dark side may be the only comfortable place, as the light side might be inhospitably hot.

On any of the middle planets, the light side would offer a dramatic view of the inner planets as crescents, appearing even bigger than the moon on closest approach. The planets only take a few days to orbit TRAPPIST-1, so from most planets, you can enjoy eclipses multiple times a week (they'd be more like transits, though, since

they wouldn't cover the whole star).

Looking away from the star on the dark side, you would see the outer-most planets in their full illuminated glory. They would be so close—only a few times the Earth-moon distance—that you could see continents, clouds, and other surface features.

The constellations in the background would appear as if someone had bumped into them, jostling the stars—a perspective skewed by the 40-light-years between TRAPPIST-1 and Earth. Orion's belt is no longer aligned. One of his shoulders is lowered.

And, with the help of binoculars, you might even spot the sun as an inconspicuous yellow star: far, faint, but familiar.

Want to teach kids about exoplanets? Go to the NASA Space Place and see our video called, "Searching for other planets like ours": <https://spaceplace.nasa.gov/exoplanet/snap/>



This artist's concept allows us to imagine what it would be like to stand on the surface of the exoplanet TRAPPIST-1f, located in the TRAPPIST-1 system in the constellation Aquarius. Credit: NASA/JPL-Caltech/T. Pyle (IPAC)

PAS Field Trip to ASU ASTRONOMY FACILITIES AND MUSEUMS Sept 19

By Sam Insana, Paul Facuna, and Terri Finch

Paul Facuna and Sam Insana led a field trip to explore several astronomy related gems in the School of Earth and Space Science on the ASU main campus in Tempe. The attendees on this trip from PAS were Mark Johnston, Mike Marron, Ophelia Waters, Terri and William Finch, Alex Vrenios, and Cynthia Jones.

The day started out as we gathered in the Bateman Physical Sciences Building on the ASU Tempe campus and went upstairs to the Ronald Greeley Center for Planetary Studies. It has photographs and maps from all major US spacecraft missions, along with a large collection of Globes (See Image 2): yes, even larger than Kevin's! There is also a library of mission documents with photos, scientific journals and many other resources to enjoy. Our friend and frequent PAS guest lecturer, Dr. David Williams, gave us an unexpected personal tour of the facilities (See Image 1) and a presentation (See Image 3) on the current research being done at the ASU School of Earth and Space.

Terri adds: Dr. Williams' presentation was about 45 minutes long. Many thanks to David! It was a fantastic presentation and we all enjoyed it and we totally appreciated him taking the time to do the presentation for our group during his busy day!

Sam continues: Dr. Williams has his office there along with other professors, and the corridors are lined with great maps, photographs, posters and drawings. We then walked around the 3rd floor enjoying and learning from the various posters and displays (See Image 4). There is even a Foucault Pendulum in the lobby, which unfortunately wasn't working that morning because an ASU student had apparently run into the exhibit with his skateboard! Before leaving this building, we checked out the displays along the bottom floor.

The 2nd Building we visited was the LROC (Lunar Reconnaissance Orbiter Camera) Science Operations Center. There are many photographs, charts, exhibits, including an actual large moon rock, and a view through a large glass window of the science team doing research (See Images 6 & 7).

We walked to the next building and visited the Mars Space Center which has a

large collection of photographs, maps, and exhibits including a Mars rover and a wall size photo mosaic of Mars. There are also beautiful rock collections from all over the world and a lab for running various kinds of analyses on minerals including spectroscopic analysis. The results of the spectroscopic analyses are compared to the spectroscopic data from remote missions to provide mineral identifications. Paul was able to arrange a personal tour of the facility by an ASU employee (See Images 9, 10, & 11).

All 9 of us then visited the ASU Memorial Union for a quick inexpensive lunch (See image 12).

After lunch we walked to the Center for Meteorite Studies. There were hundreds of meteorites on display. On the first floor through a large window a science team could be seen monitoring remote sensing equipment and on the second floor scientists and technicians could be viewed analyzing meteorites and other materials. The display cases were really informative, interesting and fun to read and learn about (See image 13).

At the last building we visited on this tour, we looked at the Marston Exploration Theater building which shows 3D astronomy movies Wednesdays at 7:30 pm and Saturdays at 2:30 pm. Sample shows are: 25 years of the Hubble Space Telescope; The Secret Life of Stars; The Search: Exploring Unknown Worlds; To the Edge of the Universe and Everything in Between. There is a charge for the movies, but no charge for any of the other museums and facilities we visited on this day.

Terri adds: The building had a wonderful display of a Mars Scene with a Mars Rover as the centerpiece (See Images 15, 16 & 17). There was also a very nice Dinosaur display opposite the Mars Scene and a huge globe of the Earth (See Image 14) that was "interac-

tive" - meaning you could change the weather patterns on the Earth's surface and also visit the planets in the Solar System.

Sam continues with: The hours for these museums and exhibits are 9 am to 5 pm Monday through Friday. PAS members are encouraged to enjoy these facilities. Probably half of us are retired, unemployed, or working part time. The rest, fully employed, would be well advised to take a vacation day to enjoy a field trip to ASU. Covered parking on campus costs about \$3 an hour so carpooling is advised. Some of the facilities will conduct 30 minute free tours to groups up to 25 people so if there are enough interested PAS members, we can set up another field trip.

Terri adds: Sam and Paul did a fantastic job of planning out the day of activities on this PAS Field Trip. Some PAS Members RSVP'd but didn't come - they missed a lot of cool stuff!



Image 1: Dr David Williams takes our Field Trip group on an unexpected tour of the facilities. It was a very informative and fun tour. Thank you so much, David. Photo by Terri.



Image 2: The many globes in the Library area of this building. Photo by Sam.

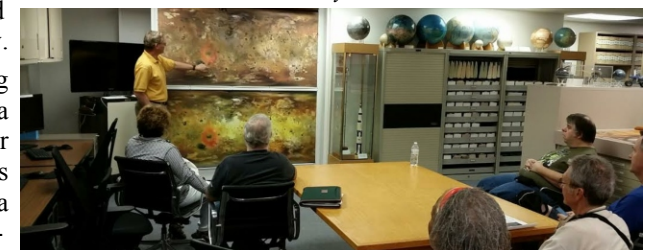


Image 3: A fantastic presentation by David sharing the current exploration research ASU has done and where this research is going. Thank you David!



Image 4: William next to a wall of planetary photos. Photo by Terri.



Image 5: Cynthia and Terri checking out an image of a collage of the planets above the Moon's surface. Photo by Alex.



Image 6: Paul in front of a huge glass window where on Paul's side of the glass are several awesome displays for the public to view, and on the other side of the glass are scientists working. Photo by Sam.

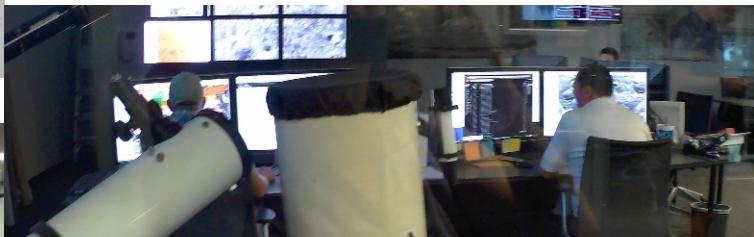


Image 7: A closer view of the scientists doing research. Photo by Terri.



Image 8: At the Mars Space Center, the gal at the front desk shared what they do there. Photo by Sam.



Image 9: Mike & Sam enjoy a display case within the Mars Space Center building. Photo by Terri.



Image 10: Cynthia, Sam and Paul view the Mars Rover in a huge glass display case. Photo by Terri.



Image 11: Sam & Paul visit the Moon. Photo by Terri.



Image 12: Lunch was enjoyed at the Student Union on the ASU campus. We each grabbed the food we wanted and met at a table to enjoy it together. It was good to sit down for a bit. I photographed all of us at the table, but (shown here) Mike and Ofelia were the most interesting photo to share. Photo by Terri.



Image 13: At the Center for Meteorite Studies we viewed and have (L – R) William, Cynthia behind Alex, Ofelia behind Sam.

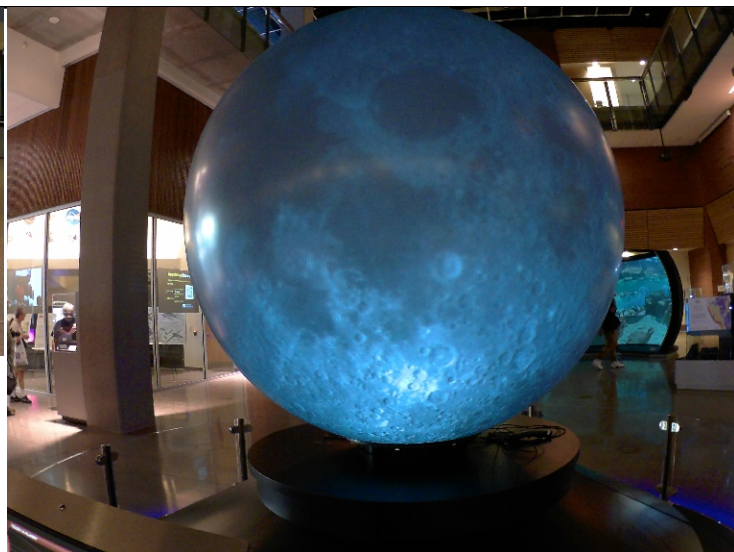


Image 14: This huge globe display is interactive. You can pick which planet, or the Moon, or a moon of a Planet you wish to create weather on, or see the rotation of the planet/moon, or learn facts about those Solar System objects. Photo by Terri.



Image 15: Photo and Caption provided by Alex: This photo of Mike shows him pointing at the treads on the Mars rover where the treads cut “JPL” in Morse Code on the surface of Mars in the dust as it traveled.

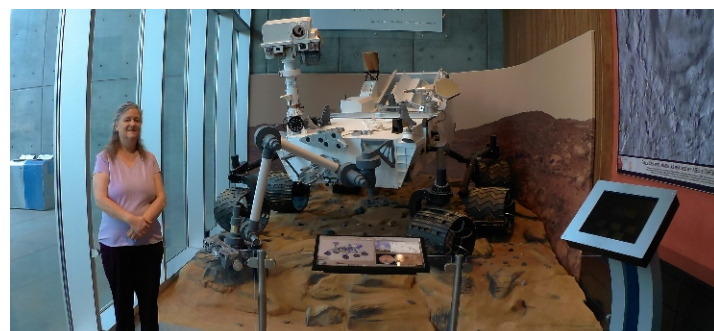


Image 16: Terri at the Mars Scene. Photo by William.

Map of PVCC Main Location

18401 N. 32nd Street | Phoenix, AZ 85032

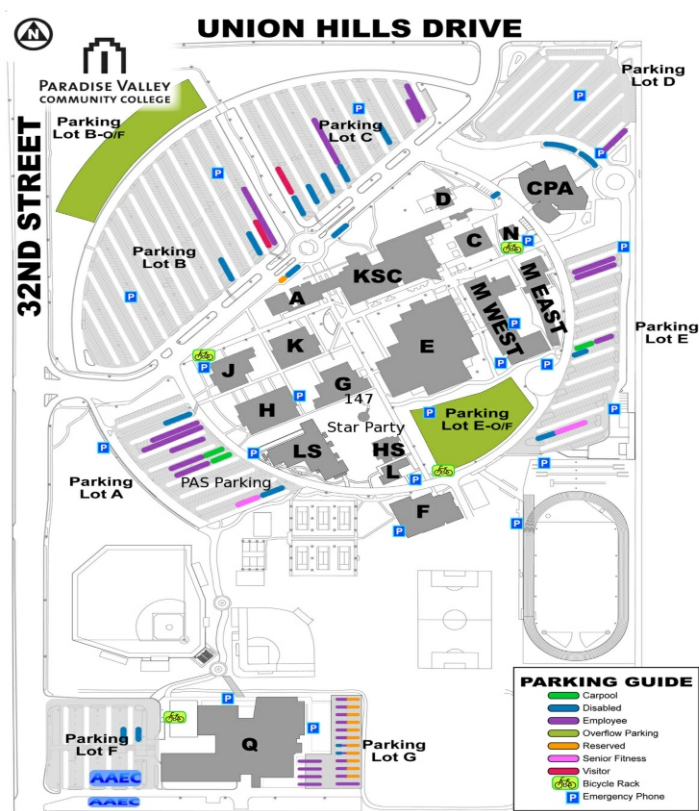


Image 17: Mike & Ofelia visiting Mars. This was a great way to conclude the PAS Field Trip. Photo by Sam.

Map of PVCC Black Mountain

34250 N. 60th Street | Scottsdale, AZ 85266

