

PAStimes

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What Meteorites on Mars Tell us about its Climate History

By James Ashley, PAS January Guest Speaker

The pursuit of an answer to the time-honored question "Are We Alone in the Universe?" leads scientists down many paths that cross a multitude of disciplines. In the planetary sciences, the quest often results in the careful engineering of robotic spacecraft designed to answer specific questions about the habitability of planets they are sent to explore. Mars is a world that is both easily accessible at reasonable costs, and potentially habitable. We are interested in the role that water may have played in Mars' geologic history primarily because of its importance to astrobiology. Each of the Mars Exploration Rover (MER) spacecraft was designed to last for 90 days on Mars in 2004. One of the two rovers (Opportunity) continues exploring today nearly nine years later. Among the many discoveries made

during this mission are several large, iron meteorites that show dramatic signs of water interaction near the martian equator. We will take a close look at these rocks and discuss their significance to climate on the Red Planet.

Dr. James Ashley is a Postdoctoral Fellow at the Lunar Reconnaissance Orbiter Camera (LROC) Science Operation Center at the ASU School of Earth and Space Exploration, where his research focuses on Lunar cave occurrence and formation, impact-related processes, and silicic deposits on the Moon. He is also on the science team for the Mars Exploration Rover mission, and will be talking about meteorites found on Mars by the Spirit and Opportunity spacecraft.

Join us at the Jan 3 PAS Meeting where James will share this exciting info with you! Bring a friend and a snack to share. Water will be provided by President Bruce. Doors open at 7pm in LS-205. See you there. §



PAS Meeting December 6

By Terri, Event Coordinator

I wish to open this meeting review with a big thanks to Mikey Webb, the PAS Host, for getting everyone signed in at this meeting. This meeting had a large amount of people in attendance. There were very few empty seats available. Many thanks to Ed Wurst for bringing the cake, donuts and other desserts. Thanks so much to Sam Insana for bringing the popcorn. Darlene Ahlefeld brought snacks as well. And many thanks to Mikey and Bruce Wurst for helping one of the ladies, bring her scope from her car to the meeting, and then back to her car, when it didn't sell. This meeting was the PAS Swap Meet.

Due to the arrival of some telescope equipment running late, and so that everyone in attendance could enjoy Mike Maron's presentation, we postponed starting the meeting on time by about 10 minutes to allow time for everyone to get to the meeting, set up their Swap Meet items and be ready to listen to Mike. While setting up, Sam Insana passed out the music for the upcoming Jan 22 Music Jam at Mike's house.

The room was rearranged such that the last 3 tables on the wall sides, were turned to be flat against the wall, so that the items for the Swap Meet were able to be placed on



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January Upcoming Events

By Terri, Event Coordinator

Upcoming events list:
<http://www.pasaz.org/forums/downloads.php?do=file&id=49>

If you can assist at any of these events, Please be sure to RSVP.

Jan 1: Happy New Year

Jan 3: PAS Meeting 7pm to 10pm PVCC Main Campus LS-205. Bring a snack to share. Bring a friend! Everyone welcome!

Jan 4: Scout star party (Private) at Mike's home in Carefree 6:30 to 9pm. Volunteers will be provided dinner. Set up is 5:30pm. RSVP is required for the head count for food n gas. RSVP with Terri to attend.

Jan 8: CTCA (Private) 7pm to 9pm. RSVP with Joe. PAStimes Star Tour Members only.

Jan 10: School (Private) Event from 5pm to 8pm. RSVP is with Terri Events@pasaz.org. Pizza being provided.

Jan 11: Estrella Observatory Star Party (Private), Potluck 5:30pm, RSVP with Terri to attend.

Jan 12: Dark Sky Antenna's Star Party (Private) for PAS Members only. Event begins at sundown and goes to dawn. RSVP is with Eric for this event. Bring you own everything.

Jan 13: Free Telescope Workshop at Bookmans 3:30 to 5:30pm. Bookmans is at 19th Ave & Northern, N.W. Corner. We meet in the musical instrument section. RSVP is required with Terri Events@pasaz.org. When you RSVP, mention the type of scope you are seeking assistance with so that we may match you up to a teacher who can help you. This is also a good class to attend to get ideas on what type of scope you should purchase.

Jan 15: Black Mountain Campus Public Star Party 7pm to 10pm. RSVP is with Terri. Bring everyone you know! Black Mountain campus is located at 60th Street and Carefree Hwy. Awesome dark sky location!

Jan 17: Free Telescope Workshop at PVCC main Campus - 32nd Street & Union Hills- 7pm to 10pm. RSVP is required with [Terri Events@pasaz.org](mailto:Terri_Events@pasaz.org). When you RSVP - leave number in your party and type of

scope you are seeking help with. This is also a good class to attend to get ideas on what type of scope you should purchase. And this is a public Star Party!

Jan 18: School Event (Private) from 5:30 to 8:30pm. RSVP is with Terri Events@pasaz.org. Pizza being provided.

Jan 22: CTCA Back up date for Jan 8.

Jan 26: The Part of the Year - the PAS Social (Private). Time: 4pm to whenever. Potluck is at 5pm. Set up is 3pm. Location is Chris's home in Goodyear. Read all about this event in this issue, 2 articles: "Plans for the Social" & "How to play the White Dwarf Game."

Jan 31: Meeting of the Minds 7pm to 10pm PVCC Main campus Rm LS 205. If there aren't enough topics to hold a meeting, this meeting gets canceled. Tentative.

Feb 5: CTCA (Private) 7pm to 9pm. RSVP with Joe. PAStimes Star Tour Members only.

Feb 7: PAS Meeting 7pm to 10pm PVCC Main Campus LS-205. Bring a snack to share. Bring a friend! Everyone welcome!§

A Quick Reminder That Your Dues Are Due

By Terri, Event Coordinator

The PAS year runs from January to December, but we start asking our members to renew their membership in September, to make it easier for Mike, our Treasurer, to get the files updated.

The PAS Roster is always available for members to view on our website in the Member's Download section. If you are a current member of PAS, your membership officially ends December 31, but we extend one month to allow for those who can't get a check to Mike earlier.

But at the end 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 Mike. If you are unsure of your status, pop into the Roster at this link: <http://www.pasaz.org/forums/downloads.php?do=file&id=48> to see if your membership shows you are current through 2013 (right side of document). If not, please consider renewing your membership, and soon. We don't want to have to remove you from our list of Awesome PAS Members. PAS-times Star Tour Members must be current, before December 31 to receive compensation for helping at a paid event. Convenient ways to pay include: bring cash to a meeting

to give to Mike, and be sure to get a receipt for your membership dues, or send Mike a check with your membership form. Be sure your membership form shows 2013 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 (2013) is available now.§

Plans for This Year: Pas Social

By Terri, Event Coordinator

The PAS Social is the once a year **EVENT OF THE YEAR!** It is usually held in January or February, and is not related to a Christmas Party. It is a Social gathering, where by we get to know our fellow PAS Members. Bring your spouse & immediate Family. PAS Members may invite 1 guest, each.

Location of this event is at Chris's home in Goodyear for the 2013 PAS Social. Map and directions and RSVP can be found at [this link: http://www.pasaz.org/forums/calendar.php?do=getinfo&e=962&day=2013-1-26](http://www.pasaz.org/forums/calendar.php?do=getinfo&e=962&day=2013-1-26).

Event begins on January 26, 2013 at 4pm. We will postpone eating until 5pm to allow everyone to arrive. Those wishing to help me set up, please be there around 3pm. Thanks so very much!

Here are the plans for this years' event!

1) Food - lots of food. This is a potluck. Please bring a main dish to share, enough to feed 15-20 people. It is best if each person brings a dish, if the dish size feeds 10, to assure that there is enough to go around. Please bring a drink to share (a 2 liter bottle of pop, or 6 pack, or some equivalent amount. Please, no alcohol, as kids may be attending. I believe I can get a case of water to be at this event, provided by President Bruce.)

2) We will have the White Dwarf Gift Exchange. What is this? This is a game we play, every PAS Social, whereby you bring a wrapped, disguised, gift, astronomy related with the worth of around \$20. Then, you

put your gift into the pile of gifts on the gift table and we play our game. Game rules will be posted in another article within this newsletter. It's a fun, silly game but worth the fun. Remember, **FIGHT** for the gift you want!

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 or phone 602-561-5398, up to the day before the event. Please wear your PAS Name tags. 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 in PerfectPotluck.com with the main dish, any extras and drinks you will be bringing. We are avoiding duplicates. For example: Jerry might bring Pizza and Wings. Therefore, no one else should be bringing pizza, but wings are all different, so if it is from a different location, we might want to have some of those too. 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 and you put in "Finch" as the coordinator and the passwords is "20120126." Try to bring something different & unique. It is more fun for our taste buds that way.

5) Bring a movie to share on DVD or BlueRay, 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 back yard at Chris's home. Please be careful throwing your darts. Darts will be provided but it would be helpful if we had more dart boards to make the game flow quicker. Also, you may wish to dress warmly. There is a Trophy, provided by Jerry Belcher, for 1ST PLACE. Competition is stiff, however, everyone should play because it is fun.

Tables and chairs are needed so we can enjoy dinner. If you have access to several, drop me an email so we can start making plans and I can let you know if you need to bring your collection, or if we have enough for the event. Thanks so much.

Door prizes are needed. Drop me an email, let me know how many you can provide. Door prizes can be anything, doesn't have to be astronomy related, just wrap it and tell me how many you have to donate. Past door prizes have been mugs, nick nacks, and other non astronomy related items. The more door prizes we have available, the more fun and prizes can be awarded.

We hope everyone can attend. It is always so much fun and a great get together. The Food and people are a good reason to come, even if you don't wish to play the games with us. Come for the socializing! Bring food to share. Many thanks goes to Chris & Tiffany Johnson for hosting this year's event. See you there! §

How to Play the White Dwarf Gift Exchange Game

By Terri, Event Coordinator

We gather in a circle, or somewhat a circle, in Mike's living room. There is a table with gifts on it, each one is wrapped and disguised so no knows what is is or who it is from. This is the start of the game. Everyone attending the Social has been given a raffle ticket in trade for their wrapped gift. You must provide a gift to be involved in the game.

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!

Rule 4: No opening gifts until told to do so.

When all gifts have been taken from the table, a new ticket is drawn. That Player will read anything stuck to the top 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 (to be decided at time of game) will then open their gift, in the same manner.

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

How to Play the White Dwarf Gift Exchange Game

From page 3
your gifts.

When we are all done opening the gifts, if you received a gift you do not wish to keep, you may put your gift on the gift table, and swap with someone else. Meaning... you got a flashlight, for example. You put it on the table, and before you leave for the night, you choose something else from

the table that another player left behind. It is a way to exchange gifts.

Please, everyone playing the game, be sure to help clean up the papers from the wrappings on the floor, and put up the chairs so we can then do another activity, or watch a movie. This is a fun game. Everyone playing MUST have a gift to exchange.

No gift, and you do not play the game with us. Gift should be worth about \$20.

If you aren't playing the game and would like to help out, please bring a digital camera that you can take tons of photos of the event and send them my way for inclusion in the PAS Photo Gallery. That would be greatly appreciated!§

Astro Day Meteor Shower Party Oct 20

By Terri, Event Coordinator

Arriving late to any event is not that much fun. By the time William and I arrived, dinner had been picked over and most of the food was gone, but we put our pot of beans into the collection, and before we left that night, a full pot of beans was down to about 1/3 left.

In attendance from PAS was: Don Boyd, Sam Insana, Eric & Ora Steinberg and their son, William & Terri Finch, Rick Cunningham with a friend and her telescope attending, Earl DeLong, and Kevin Harcey. Also attending was Judy Wolff and Diane Smith.

The evening started out clear as a bell. Awesome views. Not many meteors were seen all night long. We showed many objects. We had about 30 or so people from the public attend. Several were repeats from the event at ASU West on Wed Oct 17 and the event on Thursday at PVCC Black Mountain Oct 18.

Originally, I had gotten contacted by AZ Republic newspaper who did a brief interview of what to expect for the Orionids Meteor Shower. And so, in the process of explaining the best time to view the meteors, I also told Mike Clancy about our public event on this evening at Mike's, requiring RSVP by calling Mike. So, then Mike got contacted by NBC Nightly News

who said they wanted to come out and photograph the telescopes, the people observing, etc. Mike said ok, and they said they'd call back on Saturday to let him know for sure if they were coming out. They called back and canceled. But AZ Republic put a very nice announcement of the event in their paper. Sam sent me a copy of the article, and Matt sent me this link to the same article. Thank you both for sending them my way.
http://www.azcentral.com/arizonarepublic/arizonaliving/articles/2012/10/17/20121017catch-weekend-orionid-meteor-shower.html?nclick_check=1

So, viewing was awesome for about the first 3 hours, then the clouds came. So, people started to leave. The sky was totally covered in clouds until Eric left. Once he drove away, the sky started to clear and except for clouds circling the horizon all the around the sky, we got clear skies above and caught a glimpse of Jupiter. But, by then only the hardcore PAS Members were left: William, Terri, Don, Rick + Friend, Kevin & Mike (not that Mike would have left his own home). The sky cleared about 45 minutes after Eric had left, and I texted him to let him know about it. I thanked him for taking the clouds with him when he left. So, then Don, Rick and I were the only

scopes left, so we looked at some more cool things, and about 45 minutes were clouded out, completely again. This time we packed up, but only Rick and his friend left. The rest of us went indoors and had a snack, as we were pretty hungry by then. And around 1:30, the rest of us left Mike's leaving him all by himself.

I wish to thank all who attended with scopes. I think the public who came to this event were very impressed. We mentioned to them to return for the November Leonids and the December Geminids at Mike's. Many thanks to Mike for hosting the party. And thanks to all who brought food, it was very appreciated. See you at the next Meteor Shower party, soon.

Ora writes: Nice to see you-sort of-in the dark. Glad we could help out by taking the clouds with us when we left.

Earl writes: This was my first star party and potluck in Carefree. Mike is a gracious host and always entertaining. I arrived about 5 pm and another vehicle pull in behind me. His name is Lloyd and he is a potential new member. Like myself, Lloyd relocated from the midwest after vacationing here for years. I also met Rick another midwesterner and club member. Once again, everyone made me feel welcome. This location in Carefree is a good

Continued on page 7

PAS Meeting December 6

From page 1

those tables and bid on. Along the right side of the room, Bruce had brought all the telescopes and parts that PAS has acquired, to be sold as voted upon at the Nov 29 Meeting of the MInds. Kevin had brought some items for sale. The huge scope and accessories were set up at the back left side of the room, near the door. Jerry Belcher brought the Calendars and other items people had ordered through him at the previous meeting. It was a very interesting meeting

with all the swapping of money & picking up of items. As far as I know, no swap meeting items sold, this time.

So, we turned the meeting over to Mike Marron who shared with us some awesome info. The meeting progressed and Mike was doing a fantastic job, with humor, interesting info, and just a very enjoyable, informative presentation. When he concluded, we closed the meeting but left the Swap Meet open so that those who wished to complete

their transactions, could. Then, it was clean up time. I wish to thank those who assisted in putting the room back together before we left. The cleaning ladies showed up and chased us from the room around 10:10pm. Many thanks to everyone who attended. There were about 8 of Jenny's students in attendance and 16+ PAS members there. Many thanks to everyone who attended the PAS Swap Meet this year, & brought something for sale. See you at the next meeting!§

Mike's Halloween Party Oct 27

By Terri, Event Coordinator for PAS

Mike's Halloween party of 2012 was an interesting collection of costumes and not costumes. Arriving in costume we had Darlene Ahlefeld who came as Pleiades. If I were giving prizes for costumes, which we originally had planned but no one donated any prizes for this purpose, I would say that Darlene won! We had Kevin Harcey arrive in what looked like Indiana Jones hat. He had made an interesting food item that had a skull with gummy worms, rotisserie chicken pulled apart, noodles and some other things. It tasted mostly of chicken covered in gummy worms juice. Very strange. We also had William and I arrive with horns on our heads. We were a bit devilish and this went with our potluck food, which we made 2 batches of Garlic Hummus. One batch was just very Garlic-y and the other batch was Hummus from Hell in which William added 5 Habanero peppers to the batch. Several Hot Head Astronomers in our bunch (meaning they like spicy foods) said it was very good. I didn't

try it, I'm a wimp. We also had Sam Insana arrive in his Star Trek Scotty shirt. That was about all the costumes we had for the night. Other people in attendance were Bruce, Ed and Bette Wurst who brought costumes but I didn't see them put them on, & Mike Marron who hosted the party, but wore no costume. Don Boyd, Judy Wolff, & Diane Smith were in attendance. Visiting us from way across Arizona, Bob Senzer came as a construction worker. Eric & Ora Steinberg & their son also joined the fun for this night. Judy brought her friend June. There was plenty of food, a nice variety and everyone filled their tummies.

After eating, we branched off. Several of us stayed around the food and table and played games. Diane wanted to play chess and she is in Mensa. I played, lost the first game, but won the 2nd and I know she was just being nice. I would have lost the second as well, and it's no big deal to lose, for me. But I appreciate Diane making it more in-

teresting to me by letting me win. I play for the fun of the game. Win or lose doesn't matter to me, as much as it matters to others. Then we changed to Uno. And for this game, people came and went. We had, at one time, 6 of us playing. That was when the game was at its best. The other group of party goers went in the living room and watched 2 movies Judy brought. After the 2 movies ended, is when everyone decided to go home. The party broke up early, but William and I stayed longer with Don, Kevin and Mike to chat. I think we got home 2am, but that was after I got a long nap in. That was an awesome party. Not what I expected in costumes but it was fun and the food was good. I'd like to collect now, prizes for next year's halloween costume contest. Donate anything as a prize. Thanks. Many thanks to Mike for hosting the party. The photos of this event, with Darlene's costume and Kevin's strange skull food, are in the PAS Photo Gallery. Take a peek. §

CTCA/PAS SkyTour Event Tuesday November 6th (Election Day), 2012 Report

Report by Laurice Dee PhD., Albert Tucker Phoenix Astronomical Society (PAS) Member, and Joseph T Collins, CancerFighter @ CTCA WRMC & PAS Member

Attendees: PAS members: Joe Collins and Albert Tucker filling in for Mike Marron. Volunteers: Laurice Dee Ph.D. and Renee Collins. We had a combined total of twelve CTCA patients, care-givers, and employees join us on the 5th floor garden terrace for Jupiter and Deep Sky Object viewing.

Laurice Dee Ph.D. <launchspace@msn.com>: The weather turned out to be good for the CTCA Sky-Tour event that was held on the 6th of November. Chilly temps with completely clear skies.

I made it to the CTCA for dinner and went up to the 5th-floor terrace to participate in the preparations before the event started. Since Joe Collins already had his telescope set up and running, he had the opportunity to show me some celestial objects. Some patients and their caregivers arrived not too long after. Joe showed them some deep-sky objects and then turned his telescope to Jupiter and its Galilean satellites. I explained to the patients and their caregivers about the Jovian system while

using Joe's iPad that showed the large gas planet and its four main moons. When they could not understand what I was saying, I let the iPad 'do the speaking' for me. I also used the iPad to show a number of other celestial objects. I found the iPad to be an extremely useful tool in sharing info about the various objects in our solar system, as well as in the deep sky. This is definitely something that I'd use when explaining about the objects that are being shown through the telescopes set up for the event.

Albert Tucker <atuk@usa.net>: The evening went well considering the obstacles. It was hard to keep the customers focused on astronomy with so much happening in the political arena. It was noted that several patients stated they were leaving the next day to protect property from damage by looters. We did have a great view of Jupiter with many requests to review Jupiter when they returned with friends and family. The temperature was very pleasant, almost cool so hydration was not a big factor. One patient was so much fun I showed him how to focus and operat-

ed the mount while I took a comfort break. It was a successful and relaxing evening, thanks for inviting me.

Joe Collins <jcollins79@cox.net>: Despite the background drama of elections and some logistical issues, we still had a moderately attended and successful event. Tonight was 'moonless', so we were able to look at dark sky Messier Objects. During the course of the night, our CTCA customers viewed: M45 (Pleiades), M42 (Orion Nebula), M57 (Ring Nebula), M11, M26, M32, Double Cluster, M2, M79, Helix Nebula; planets: Neptune, Uranus, Jupiter and Galilean satellites; and double stars: Albireo, Eta-Cassiopeia, Nu-Draconis, and several more. We also saw three bright shooting stars in the Western Sky not from any of the meteor showers we expected! Another unexpected treat this evening: Samantha, a caregiver, and former presenter at a Planetarium in Ohio, shared with customers about tonight's constellations in Greek and Hopi/Navajo folklore while they waited to view through the telescopes.

There were a few logistical issues that

Continued on page 6

CTCA/PAS SkyTour

From page 5

I will discuss with Jennifer Kehren when she gets back from her business trips in December. If anyone has any feedback or ideas to make these events more enjoyable for CTCA patients and caregivers (and for ourselves), please let me know!

The next SkyTour event will be on the 4th of December – with a backup date of December 18th.

We extend our thanks to Jennifer Kehren for advertising, providing meal tickets and color printouts of our handouts. We

also thank the CTCA Café for providing dinner. Thanks to PAS members who attended for working and volunteering their time to make this event a success and enjoyable for CTCA patients and caregivers!§

Rockie's Space Report

By Rockie Hervieux

Oct meeting: Hello. My name is Rockie Rocket Hervieux. I'm the youngest member of PAS. I also attend 5th grade at Echo Mountain Intermediate Elementary School in Phoenix, Arizona. In October, the club heard a presentation by Dan Heim. He spoke about rainbows and prisms. I saw many slides of rainbows and halos. My favorite slide was called Winter Haze. I liked it because it looked so beautiful. You can get a puzzle too. There are many ways and places that you can see a rainbow. In order to see a rainbow you need three things: water droplets, sunshine, and atmosphere. When light shines through the water droplets, it creates a rainbow. So what is water made of? Water is made of oxygen and hydrogen. (H₂O). I loved the presentation.

Nov meeting: Last week we have voted for Treasurer, President, and Vice President. We had heard from another speaker. His name was Dr. David. A. Williams. He asked, "How do we find out info about our solar system"? Send satellites of course! He even talked about asteroids. The main characteristic of asteroids is that they have rocky bodies. The main belt is near Mars and Jupiter. We also learned that Saturn's moon shoots out water vapor. And we learned that Ceres takes 4.6 Earth years to orbit the sun. Another large asteroid that we learned about is called Asteroid Vesta. It was imaged in great detail by the Hubble Space Telescope.

The latest main mission that helped scientists to learn about these asteroids was a satellite is called Dawn. Dawn's goal is to

meet asteroids Ceres and Vesta. Dawn has solar panels. Xenon (xe) helps Dawn survive. Xenon is a gas chemical. Ceres is a large, wet asteroid. The first phase for Dawn is approach. It was a complex tracking and computers for the approach. On Vesta it has two basins at the south pole. What used to be a volcano on Vesta has been destroyed. There is no evidence of Vestan moons. A true fact about Vesta: if you sneeze the gravity will not help. It was very fun and if you want to learn more please go to www.nasa.com.

Space has many wonderful and exciting things. I look forward to sharing them with you. Won't you come on the adventure with me? Do not forget to visit me at the next star party! See you there. §

Desert Botanical Gardens Nov 10

By Terri, Event Coordinator

What a frosty, windy, rainy night this was. Don Boyd, Mike Marron, William & Terri Finch attended the Kids Astronomy Night at DBG. Driving down to DBG, it was raining to the North, East and West of us, with a light sprinkle on our vehicle. We got down there and Don joined us shortly after. We stood outside our vehicles talking in the windy & light sprinkle, waiting for our contact, Emily to show up. She didn't, so we three decided to take a walk to the restroom, as that's what cold weather does to me. On the way back from the restroom, we ran across Emily, and it was still drizzling rain and complete overcast. Are we nuts, or what?

So, Mike called as we were leaving Emily, said he'd be another ½ hour getting there. He and Ofelia Waters went to a movie before this event. We arrived, still it was sprinkling rain. People arrived for the event, and Emily and a photographer Mary, were there setting up their activities. Mike got there about 6:45 and set up his meteorites. Ofelia was very pleasant to have at this

event. Mike and Ofelia were not dressed for the extreme cold temps and wind chill.

So, about 7:10 the drizzle went away so I uncovered my scope and found the first object. While I was doing that Emily was introducing the group to what to expect and what to do at this event. She then turned it over to me and I did a sky tour. Due to clouds, I could only share the Summer Triangle & its 3 constellations, and Cassiopeia, but it was a great sky tour. Then, through the night, we showed many objects, as the clouds would permit. Jupiter was a great hit. Andromeda Galaxy was found on this night as well as Perseids Double Cluster, ET Cluster, Alberio, Ring Nebula, and a few others. The evening warmed, or maybe the wind stopped blowing, and so I was able to come out from under my hat. Mike had set up on a table and like usual, stole the show for most of the evening. I did Q & A and gave out NASA Calendars, NSN Star Charts & PAS Bookmarks. By 9pm, all the patrons had left. Emily packed up as well, and Don, Mike and I packed up. It was a

successful event that we didn't think would be successful due to the storm. It was very cold and windy at first, but cleared a little, and the wind died down enough to enjoy the event. Many thanks to DBG for having us at this event. Next 2 DBG events are tentatively scheduled on Apr 12 for the Adults and May 18 for the Kids event. Many thanks to Don, Mike, Ofelia and William for attending this event with me and helping to make it a great success.

Emily Morris writes: Hello Star Party Participants, Thank you so much for attending our Family Star Party at the Desert Botanical Garden on the 10th. It was a program weekend, despite the weather. I want to thank our partners in this event, the Phoenix Astronomical Society, as we really couldn't have done it without them! The photos in the PAS Photo Gallery were taken Mary Versosky. I hope you all have a wonderful Thanksgiving and that we see you soon. §



Partnering to Solve Saturn's Mysteries

By Diane K. Fisher

From December 2010 through mid-summer 2011, a giant storm raged in Saturn's northern hemisphere. It was clearly visible not only to NASA's Cassini spacecraft orbiting Saturn, but also astronomers here on Earth—even those watching from their back yards. The storm came as a surprise, since it was about 10 years earlier in Saturn's seasonal cycle than expected from observations of similar storms in the past. Saturn's year is about 30 Earth years. Saturn is tilted on its axis (about 27° to Earth's 23°), causing it to have seasons as Earth does.

But even more surprising than the unseasonal storm was the related event that followed.

First, a giant bubble of very warm material broke through the clouds in the region of the now-abated storm, suddenly raising the temperature of Saturn's stratosphere over 150 °F. Accompanying this enormous "burp" was a sudden increase in ethylene gas. It took Cassini's Composite Infrared Spectrometer instrument to detect it.

According to Dr. Scott Edgington, Deputy Project Scientist for Cassini, "Ethylene [C₂H₄] is normally present in only very low concentrations in Saturn's atmosphere and has been very difficult to detect.

Although it is a transitional product of the thermochemical processes that normally occur in Saturn's atmosphere, the concentrations detected concurrent with the big 'burp' were 100 times what we would expect."

So what was going on?

Chemical reaction rates vary greatly with the energy available for the process. Saturn's seasonal changes are exaggerated due to the effect of the rings acting as venetian blinds, throwing the northern hemisphere into shade during winter. So when the Sun again reaches the northern hemisphere, the photochemical reactions that take place in the atmosphere can speed up quickly. If not for its rings, Saturn's seasons would vary as predictably as Earth's.

But there may be another cycle going on besides the seasonal one. Computer models are based on expected reaction rates for the temperatures and pressures in Saturn's atmosphere, explains Edgington. However, it is very difficult to validate those models here on Earth. Setting up a lab to replicate conditions on Saturn is not easy!

Also contributing to the apparent mystery is the fact that haze on Saturn often obscures the view of storms below. Only once in a while do storms punch through the

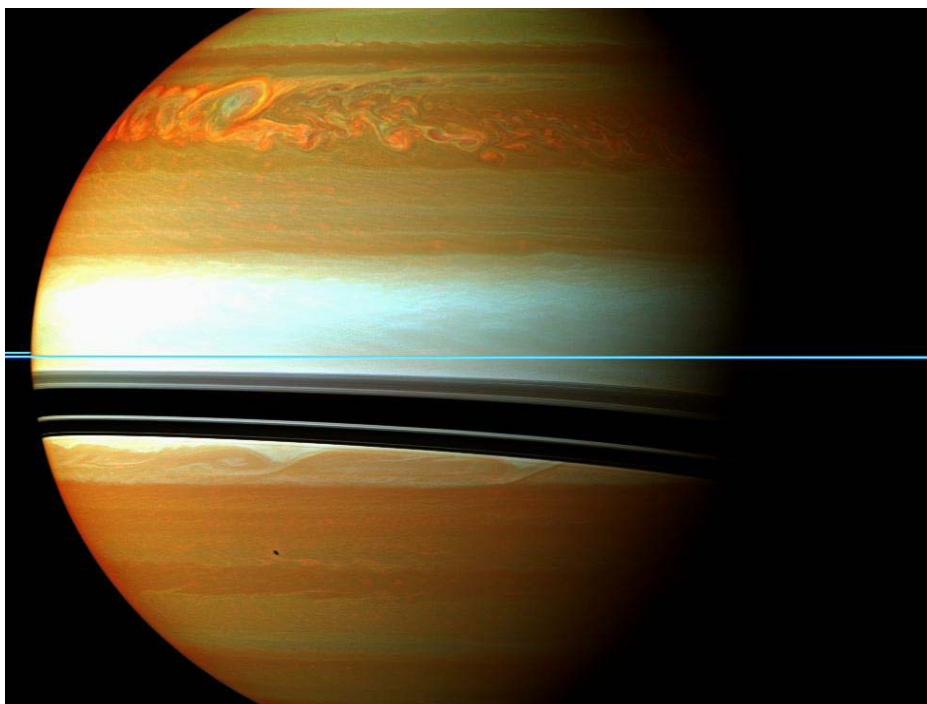
hazes. Astronomers may have previously missed large storms, thus failing to notice any non-seasonal patterns.

As for atmospheric events that are visible to Earth-bound telescopes, Edgington is particularly grateful for non-professional astronomers. While these astronomers are free to watch a planet continuously over long periods and record their finding in photographs, Cassini and its several science instruments must be shared with other scientists. Observation time on Cassini is planned more than six months in advance, making it difficult to immediately train it on the unexpected. That's where the volunteer astronomers come in, keeping a continuous watch on the changes taking place on Saturn.

Edgington says, "Astronomy is one of those fields of study where amateurs can contribute as much as professionals."

Go to <http://saturn.jpl.nasa.gov/> to read about the latest Cassini discoveries. For kids, The space Place has lots of ways to explore Saturn at <http://spaceplace.nasa.gov/search/cassini/>.

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Astro Day

From page 4

dark sky observing site. Unfortunately, we were clouded out around 10 pm. I enjoyed observing through Sam's, Don's, Eric's, Terri and William's telescopes. We were able to see many old favorites. We also saw a nice Iridium flare and a nice sporadic meteor. I did not see any Orionids however. If you have not made it to Mike's, it is worth the trip. I look forward to my next visit. ***

Orionids Meteor Shower Oct 20

By Sue Thiebes

I saw one! I was camping up near Payson, beautiful night. as we'd been working hard all day trail building, we went to sleep at 7pm! So of course I woke up several times through the night, and had many hours gazing up from my truck bed – beautiful night, but only 1 meteor! Must have slept through the rest of them, despite thinking about bears (but I saw 0 bears. which is a good thing.) fewer bears than shooting stars, that's got to be a good statistic... §

Arizona Sky

Leah Sapir



In January 1610, when Galileo Galilei turned his new telescope toward Jupiter, he noticed three small stars nearby: one on the west and two in the east. The following night, he again saw three small stars, but this time they were on the west; and two nights later, he saw only two, both in the east. As he continued to watch Jupiter on every clear night, he always saw two, three or four little stars nearby in various positions. It took Galileo about two weeks to realize that these were not background stars, but four tiny moons orbiting Jupiter. It was the first observation of moons orbiting an object other than the Earth. Galileo announced this discovery, along with his other telescopic observations, in a booklet named "Siderius Nuncius" ("The Starry Messenger") in March 1610.

By the 1670's, astronomers had measured the exact time of each moon's orbit; but when they timed occultations (where one or another moon disappears behind Jupiter), they found that the moons seemed to reappear at the "wrong" times: they were seen sooner than expected when Jupiter was closer to Earth, and later when Jupiter was farther away. Danish astronomer Ole Romer realized in 1675 that these differences were the result of the time it took for light from the moons to travel the extra distance; and this enabled the first measurement of the speed of light.

Being so close to the giant planet, all four of the Galilean moons are "tidally locked", like Earth's Moon. This means that the length of a moon's "day" (i.e. the time required for one complete turn on its axis) is equal to the length of one orbit; and therefore each of the Galilean moons always keeps the same face towards Jupiter. The three inner moons also exhibit a "tidal resonance", where the orbital period of Europa is twice that of Io, and Ganymede's orbital period is twice Europa's.

In a home telescope, the Galilean moons seem like identical quadruplets – four little dots, all in a row, like a string of pearls. But actually, each one has its own "personality".

Io, closest to Jupiter, is 2280 miles in diameter (slightly larger than Earth's

Moon), and orbits Jupiter in 1.8 days, at a distance of 264,000 miles. (For comparison: Earth's Moon has a diameter of 2170 miles and average distance of 240,000 miles from Earth.) Io's surface is very colorful, dotted with blobs of white, yellow, orange and green. These are a result of its volcanic activity - Io has over 400 active volcanoes, which eject both lava (molten silicate rock) and molten sulfur. The sulfur and sulfur compounds harden on the surface to produce Io's colorful polka dots.

In 1979, Voyager 1 photographed eight volcanoes erupting simultaneously on Io, and many additional volcanic vents that didn't happen to be erupting at the time. Io's volcanic activity is apparently due to tidal energy. Io is in a tug-of-war between Jupiter's gravity on one side, and Europa and Ganymede pulling from the other. This gravitational pressure flexes the moon and generates heat, which melts layers below the surface. (See a volcano erupting on Io, in this link from NASA: <http://tinyurl.com/bscjbv>.)

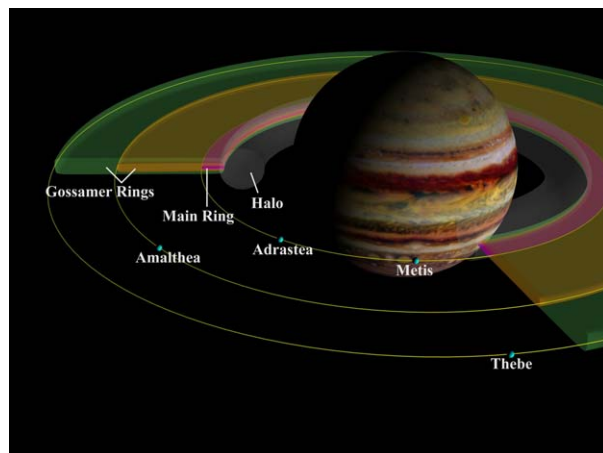
Io has a core of iron or iron sulfide, which may be solid or molten. The core is rather large – with a radius of around 550 miles, it goes halfway from Io's center to the surface. The core is surrounded by a mantle of molten or partially molten silicate rock, and a crust of solid rock, coated on the outside with sulfur compounds. Io's surface features include calderas several miles deep, lakes of molten sulfur, volcanic vents, and over 100 non-volcanic mountains, some of which are taller than Mt Everest. Io does not seem to have any water, but it has a thin atmosphere of sulfur dioxide.

Io generates an electric current when it crosses the lines of Jupiter's magnetic field; and Io might also have a magnetic field of its own.

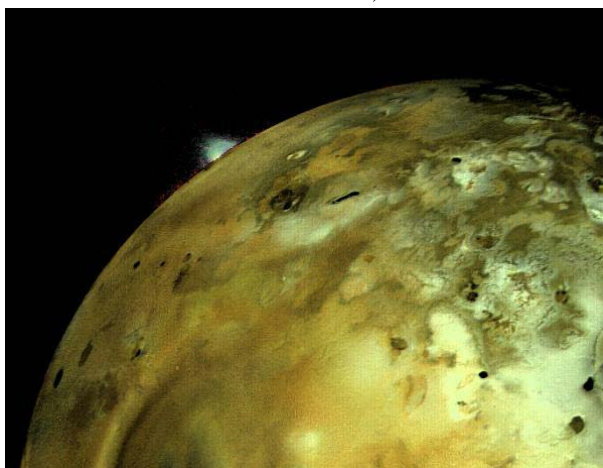
Next out is Europa, 1950 miles in diameter, which orbits Jupiter in 3.6 days, at a distance of 420,000 miles. Europa is covered with water ice, but the ice is



Jupiter moon "family portrait". From top to bottom: Io, Europa, Ganymede, Callisto. (picture credit: NASA)



A diagram of Jupiter's inner moons and rings. (picture credit: NASA)



A volcano erupting on Io, photographed by Voyager.

cracked all over due to tidal forces. No feature on the surface is more than a few hundred yards high. There are very few craters, indicating a "young" surface; i.e. recently resurfaced by ice that melted and refroze.



Arizona Sky

from page 8

Europa is composed of a small metallic core with a layer of silicate rock around it; a thick, soft layer of water or slush around 30 miles deep; and a thin crust of impure water ice. Amazingly, Europa has twice as much water as Earth. The heat inside Europa that keeps the water melted, or partially melted, is from tidal flexing.

Europa has a very sparse atmosphere of oxygen, apparently formed when charged particles hit water vapor molecules and split them into hydrogen and oxygen. The lightweight hydrogen escapes into space, leaving the heavier oxygen molecules behind.

Europa has a weak magnetic field, which would indicate conducting material (possibly a salty ocean) beneath its surface.

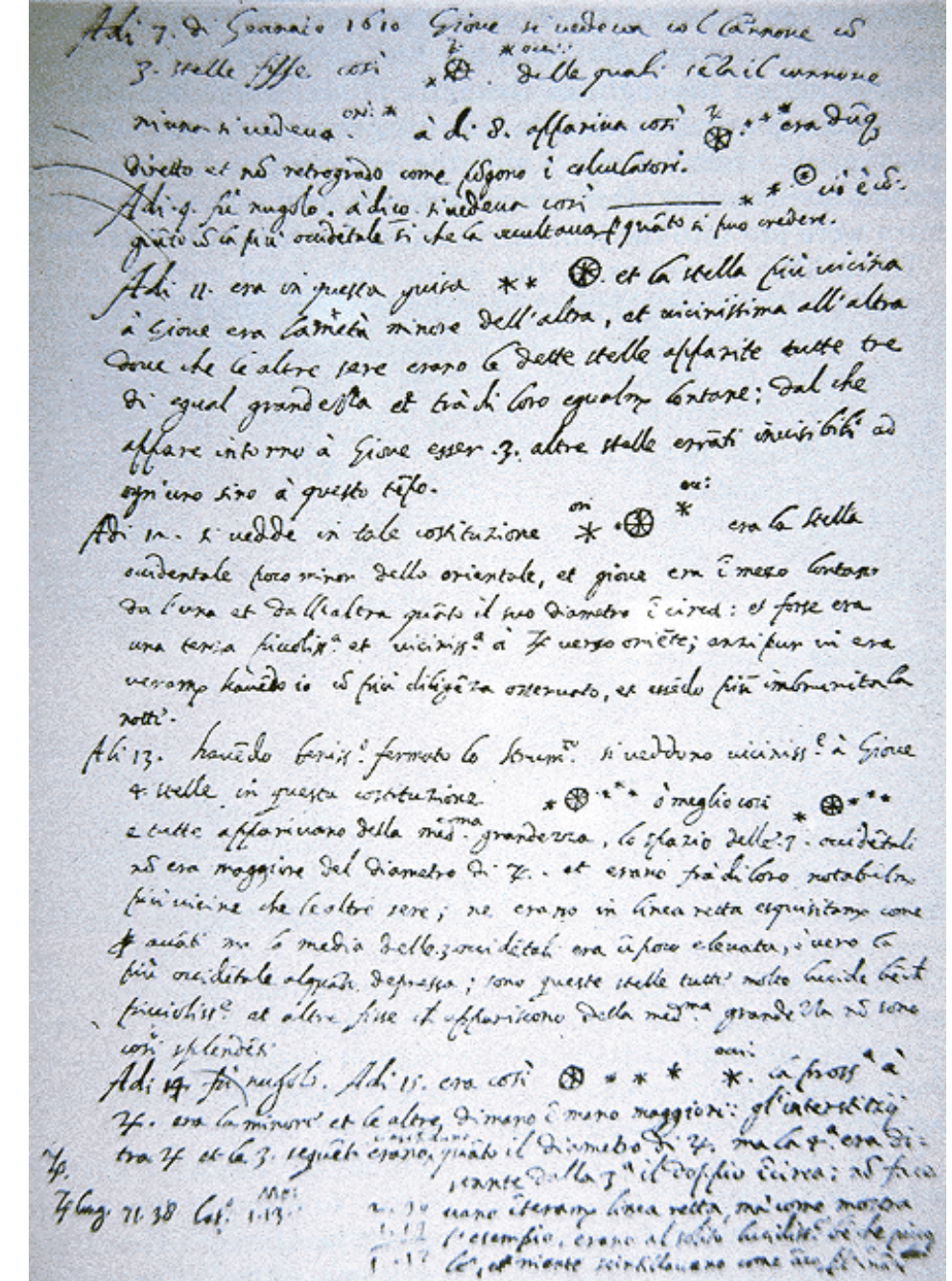
Ganymede is 3290 miles in diameter. It is the largest moon in the solar system, and is even larger than Mercury, but has only about half its mass. Ganymede orbits Jupiter in 7.2 days, at a distance of 670,000 miles.

Ganymede has a small molten iron or iron/sulfur core with a silicate rock mantle around it; a thick, soft ice layer (which could contain a salt-water ocean about 130 miles below the surface); and a thin crust of impure water ice. On the surface, some areas are dark-colored and have large numbers of impact craters, while other areas are lighter colored and have grooves and ridges on the surface. This may be the result of stress on the outer ice layers. Both areas have numerous craters, both old and young – below and on top of the grooves – as well as some young craters with rays. However, the craters are much flatter than on Earth’s Moon, possibly because of the ability of the ice crust to flow. Bright spots on Ganymede and Callisto are recent craters (i.e. newly exposed ice).

Apparently Ganymede has a very slight atmosphere of oxygen, like Europa, and maybe a little molecular hydrogen. It also has a magnetic field, apparently due to the liquid iron core.

Callisto is 3010 miles in diameter, and orbits Jupiter in 16.7 days, at a distance of 1,176,000 miles. It is slightly smaller than Mercury, but has only 1/3 of its mass. It does not experience tidal heating since it is not part of the 1:2:4 orbital resonance.

Callisto has little internal structure. It is composed of about 40% ice and 60% rock and iron, but these are not separated into



A page from Galileo's notebook

distinct layers. However, the heavier material tends to be towards the center. There also might be an underground ocean about 70 miles below the surface.

Callisto's surface is covered with very old impact craters. It is more cratered than any other object in the solar system. The largest crater, Valhalla, is 2000 miles in diameter. The larger craters are surrounded by concentric rings, but do not have the high mountains that surround craters of Mercury or Earth's moon.

Callisto has a thin atmosphere of carbon dioxide and possibly some molecular oxygen. It also

has a weak magnetic field, indicating a conducting material (perhaps salty fluid?) below the surface.

A fifth moon, Amalthea was discovered by E E Barnard in 1892, orbiting closer to Jupiter than Io. Amalthea is tiny; it is only 118 miles across, and irregularly shaped. Its surface is coated with a reddish layer of sulfur splattered onto it from Io's volcanoes. Amalthea orbits Jupiter in 12

Arizona Sky

from page 9

hours at a distance of 110,000 miles from Jupiter's center. But since Jupiter itself has a diameter of around 89,000 miles, Amalthea is only around 70,000 miles above Jupiter's cloud tops.

Three more tiny moons - Metis,Adrastea and Thebe - were discovered by Voyager 1 in 1979. Thebe is 60 miles across, and 140,000 miles from the center of Jupiter (i.e. 100,000 miles above the cloud tops). Metis is 25 miles across, and 80,000 miles from the center of Jupiter (35,000 miles above the cloud tops).Adrastea is 15 miles across, and 81,000 miles from the center of Jupiter (36,000 miles above the cloud tops). Thebe's orbital period is 16 hours, while Metis andAdrastea take only 7 hours to orbit Jupiter.

But these three moons were not the only discovery of Voyager. When Voyager took a picture from a point past Jupiter, where the planet was backlit by the Sun, the photo showed a series of faint rings. The rings were further studied by Voyager 2, by the Galileo and Cassini spacecraft, and by the Keck and Hubble telescopes. The rings can only be seen in a backlit view by space probes, or in infrared, since they are made of dark dust particles - unlike Saturn's rings, whose component particles are made of (or coated by) reflective ice, making them visible from Earth.

The rings might have formed from moons that broke apart, or from dust released by meteorite impacts on nearby moons. Even after their formation, dust is constantly being lost from the rings; it only stays around for 100-1000 years, and must be renewed by continuing meteorite impacts.

The brightest part of the system is the "main ring". It is 4400 miles wide and 20-200 miles thick, extending from 77,000 to 81,000 miles from the center of Jupiter. The outer edge ends abruptly, while the inner edge (just 32,000 miles above Jupiter's cloud tops) fades into the "halo ring" just inside. Adrastea and Metis orbit at the outer edge of the main ring, and are probably the source of the dust that composes the main and halo rings. The dust particles are mostly 0.1-10 microns in size. (A micron is 1/1000 mm, or about 1/25,000 inch.)

Inside the main ring is the "halo ring", which has a torus shape (i.e. like a donut). It is 12,000 miles wide and 8000 miles thick, going halfway from the main ring to

Jupiter's cloudtops. It extends from 62,000 to 77,000 miles from the center of Jupiter, placing the inner edge around 20,000 miles above the cloud tops. The particle size is less than 15 microns, but in areas far from the ring plane the average size of particles might be less than 1 micron. The dust probably originates in the main ring.

Outside the main ring is the faint "gossamer ring". It is 50,000 miles wide, extending from 81,000 miles to 134,000 miles from the center of Jupiter. It was probably produced by micrometeorite bombardment of Amalthea and Thebe. The gossamer ring has two parts - one bordered by Amalthea and one by Thebe. The Amalthea ring is 30 times fainter than the main ring, and the Thebe ring is 3 times fainter than that.

Outside the orbit of Callisto are another 40 or so tiny moons, which are probably captured objects. The current total is around 67 confirmed moons. Of these, 13 moons had been discovered by ground-based telescopes before the Voyager mission in 1979. Voyager found the three innermost moons, and then 32 additional moons were discovered between 1999 and 2003 by Scott Sheppard and David Jewitt.

However, despite this abundance, the four Galilean moons make up almost all of the orbiting mass; the rings and other moons are just 0.003 percent of the total mass orbiting Jupiter. Aside from the four Galilean moons, all the other moons are very tiny, less than 160 miles in diameter; many of them are just 3 miles or less.

The outermost 26 moons orbit in a retrograde direction. The 8 innermost moons (already described) have nearly circular orbits, mostly in the plane of Jupiter's equator. However, the 59 outer moons have a greater degree of eccentricity and inclination, and their orbital period varies from 130 days to 3 Earth-years.

Jupiter is currently just past its opposition - which means it is high in the east at sunset, and up for most of the night. So, this is a great time to observe this giant planet and the choreography of its larger moons. As an extra treat, Jupiter will be close to the Hyades all month.

Mars is still visible in the southwest during evening twilight. Uranus and Neptune are high in the west at sunset, with Neptune setting around 9:30 at the beginning of January, and 7:30 towards the end of the month. Uranus sets around two hours

later.

Saturn is still a morning star, but rising earlier: 3 am at the beginning of January, and 1 am at the end of the month. Venus is still visible in the morning twilight, but is starting to fade into the sunrise. And Mercury is too close to the Sun to be visible this month. In February it will be somewhat visible as an evening star.

On January 6, the third-quarter Moon will accompany Saturn in the east from 3 am to dawn. On January 10, the crescent Moon and Venus will be visible together near the eastern horizon in morning twilight, at around 7 am. Then on January 12, the crescent Moon will be near Mars in the southwest after sunset - again, close to the horizon in twilight. On January 20, the Moon will accompany the Pleiades across the sky, starting high in the south after sunset, and proceeding towards the west, till they set at around 3 am. On the following night, we will have a repeat performance, this time with the Moon, Jupiter and Hyades. And on January 26, the Moon will accompany the Beehive Cluster across the sky all night.

Wishing you all clear skies and happy observing!

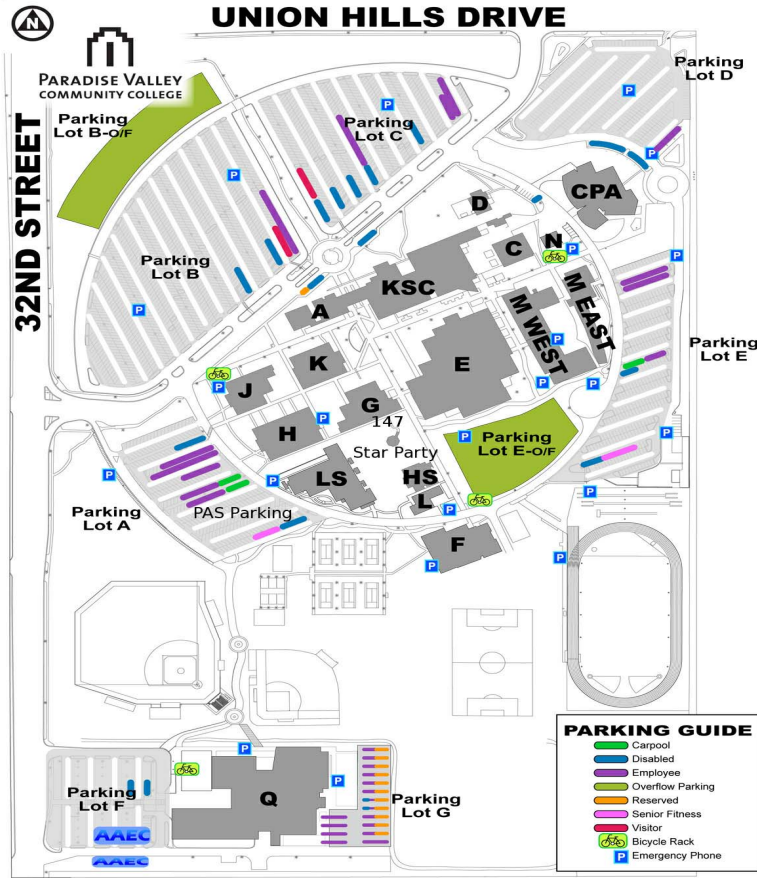
Bookmans Dec 30

Request For PAS Member's Help
By Terri, Event Coordinator

With the upcoming Comets and great astronomical planetary lineup for 2013, Dennis Young and I predict that there will be an increase in telescope sales for the Holidays and for these upcoming sky events. Therefore, at the Dec 30, 2012 Bookmans Telescope Workshop, I'd like to request the help of PAS Members who may wish to assist the public with their new telescopes. Watch for notices about this in your email & watch the forums for the upcoming Telescope Workshops both at Bookmans and PVCC, to see how many RSVP's we have. If we have more than 3 lined up for an event, I'd like to request the assistance of other PAS Members besides just Don, William and myself. We can handle 3 RSVP's at an event. Additional amounts will require your assistance. Sign up, if you are free that day to help. Your assistance is definitely appreciated. Thanks!

Map of PVCC Main Location

18401 N. 32nd Street | Phoenix, AZ 85032



Map of PVCC Black Mountain

34250 N. 60th Street | Scottsdale, AZ 85266



See page 2 for more details January 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 New Year's Day	2	3 PAS Meeting	4 Scout Party	5
6	7	8 CTCA(Private)	9	10 School Star Party	11 Estrella Star Party (Private)	12 Antennas
13 Bookmans Telescope Workshop	14	15 PVCC Black Mountain Campus	16	17 PVCC Telescope Workshop	18 School Star Party (Private)	19
20	21 Martin Luther King Day	22 CTCA Backup	23	24	25	26 PAS Social (Private)
27	28	29	30	31 MOM (Tentative)		

Don Boyd
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To:

2013 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.

Feb 7: Thomas McCarthy "Things that go bump into the Earth"

Mar 7: Melissa Morris "Which came first? The Chondrule or the Planet?"

Apr 4: TBA §

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What's Up For January

By Rod Sutter, PAS Past President

Name	Date	Rise	Set
Mercury	01-15-12	07:35	17:30
Venus	01-15-12	06:25	16:31
Mars	01-15-12	08:47	19:19
Jupiter	01-15-12	14:06	04:08
Saturn	01-15-12	01:55	12:51
Uranus	01-15-12	11:01	23:11
Neptune	01-15-12	09:30	20:33
Pluto	01-15-12	03:21	16:38

All Times Arizona Time

Planets in bold are visible during evening hours.

January 15 2012

Sunrise: 07:32

Sunset: 17:45



Full: December 28



Q3: January 4



New: January 11



Q1: January 18