PAStimes

Phoenix Astronomical Society
www.pasaz.org

May 2010
Volume 61 Issue 9

PHOENIX ASTRONOMICAL SOCIETY — ESTABLISHED 1948

Affordable DSO Astrophotography - Imaging on the Cheap

Chris Johnson will be our speaker at the May sixth meeting. We asked Chris to write a paragraph about himself and/or his topic and he was very gracious to provide the following:

Ever felt like you wanted to dabble in astrophotography but thought you couldn't afford it? You may be a visual observer who already has most of the equipment to get started and didn't even know it! Can you do high-quality astrophotography without breaking the bank? How should you allocate your budget? Can moderate mounts really be used? What's the difference between cameras anyways? How well do DSLRs stack up against dedicated astro CCDs? This month's topic will help you stretch your budget and set expectations.

Chris Johnson is the webmaster for the PAS Website, Starizona.com, Hyperstarimaging.com, and Letstalkstars.com with David Levy. He owns and operates his remote observatory in Mayer, AZ. His observatory is open to PAS members allowing, access to a very dark site during the new moon weekends. Chris often coaches and instructs members on astrophotography and holds monthly "Virtual Star Parties" at his home to allow members to remotely use his equipment to acquire their own data. His website is http://www.cuttinedgeobservatory.com.

Chris has been a Senior Systems Engineer at eBay for the last seven years and is obsessed with computers and photography. Chris would like to thank Dr. Craig Stark for assistance in preparing this presentation. Craig is a wonderful mentor and friend. http://www.stark-labs.com

April PAS Meeting Review

By Terri, Event Coordinator

This was an awesome meeting. Many, hundreds of thanks to our guest speaker, Klaus Brasch, for a fantastic presentation. Many compliments on his presentation were heard that night.

The meeting opened a tad late but was smooth sailing. Rod, our Prez, opened the meeting with a thank you to Joe Collins for donating a 12" GPS LX200 Meade scope to the club. It is housed at the Librarian's home, that's Rod. Mike announced that he will be doing a Cave Creek Museum Tour during his star party on Apr 24th. Then Rod turned the meeting over to Terri, who made some very brief announcements. Before anyone knew, Klaus was already beginning his talk.

Klaus was entertaining and informative. This was a thrilling trip! Klaus took us through some history of his trip to South America / Chile. He showed us around Chile, talked about where he stayed, and what he saw. Then he showed us the jewels of the night sky that he had photographed. Wow! Super impressive, very well taken, and a pleasure to view! Thank you so much, Klaus. We all enjoyed your presentation. I really appreciated Klaus's presentation, because not only did he share awesome photos of the night sky, but with these photos, he was able to remind the audience why we LOVE this hobby.

I wish to thank those who brought snacks to this meeting. The Wursts brought the water and cookies, Amanda donated the candy, Sam brought the popcorn, and Bruce and Sherry Meyers brought the most dreamy brownies. Wow! Those were the most delicious brownies I've ever eaten. Thank you Sherry!

Don won the 50/50 raffle this month. Congrats!!!! After we closed the meeting around 8:45pm, we announced the move to G-147 to see a special presentation from Dr. Angela Cotera. Angela does research on star formation, and is one of the prime researchers for the Hubble Space Telescope survey of the Galactic Center. She is also running for the Arizona House of Representatives.

We opened the secondary meeting at 9pm. Angela showed us her astronomical studies. It was very cool. Then she shared with us her proposal to have PAS do a star party for her Fund Raiser. It was a good meeting. Angela is going with the slogan "Sometimes it does take a Rocket Scientist." We hope to see you at the next PAS meeting. Please visit the photos for this meeting on line in the PAS Photo Gallery. ***

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Upcoming PAS May 2010 Events

By Terri, Event Coordinator

We begin the month of May with some really cool PAS events. Then round out the month with a few more awesome events! And with the weather getting nicer in the evenings, there will be more spectacular viewing events coming up in the next few months.

May 2: Bookmans Telescope Workshop from 3:30 - 5:30pm in backroom. Telescope Teachers are needed. At the time of the writing of this newsletter, we have 1 public RSVP thus far. Terri is RSVP.

May 5: Imagine Elementary School star party. PAS Volunteers are asked to assist with this star party. Rod is RSVP contact. Please RSVP in calendar or Forums for this event as well, so we have a headcount. Event is from 7pm - 9pm.

May 6: PAS meeting in PVCC Library from 7 - 9:30pm. This is Election time. Come help elect or compete for an Officer position within the club.

May 8: Virtual Star Party. Weather permitting in Mayer. Starts at 8:30 and RSVP is required with Chris. Will be held at Chris's home in Goodyear. This event will not take place if there are no PAS RSVP's. Watch in the calendar & forums for details on this event, should event status change.

May 13: PVCC Telescope Workshop from 7pm to 10pm in G-147 and outdoors on the Telescope Deck, weather permitting. This event will not take place if the weather is unsuitable. RSVP contact is with Terri. Telescope Teachers needed.

May 15: CEO = Cuttin' Edge Observatory in Mayer. Open to PAS Members only. RSVP is with Chris. Arrive waaaaay before sundown. Plan to stay over night, or if you must leave, plan your parking so your headlights do not affect the rest of the group's observing. BYO snacks, drinks, bedding. It's dark and wonderful up there. And bring jackets.

May 20: PVCC Star Party. The location will either be by the Telescope Domes or up on the nearby parking lot. As we get closer to the date, check the forums for the location. I will confirm with Dave, by then, in which location to set up. 6pm to 10pm, open to the public, everyone welcome. Volunteers needed. RSVP with Rod. Weather permitting.

May 23: Bookman's Telescope Workshop from 3:30 - 5:30pm in backroom. Telescope Teachers are needed. Terri is RSVP contact.

May 27: MEETING OF THE MINDS. This is the PAS Business meeting. We gather here, with many "Minds" to share ideas, set up the next star parties, work on issues that need to be discussed, and have an overall great time. Sometimes we have demos, videos, computer related fun, and other times, it is mostly talk about upcoming events. No RSVP is needed. But do check the calendar to be sure we are having the event. This event will not take place if there are not enough topics. We meet in G-147 from 7pm to 10pm.

July 3rd Fireworks & Star Party At Mike's

By Terri, Event Coordinator

Come to the fireworks party at Mike's in Carefree on July 3rd. Following the fireworks will be a star party. Bring a food and drink to share. It's a potluck! Movies after the star party. PAS Members are welcome. RSVP is requested with Mike. Party begins at 4pm at the end of Mike's driveway. Bring a chair, snacks and drinks for during the fireworks. ***

Bookmans Telescope Workshop Review April 18

By Terri, Event Coordinator

It was a good day for a workshop. I do have to apologize for being late. It was a rough day getting going after doing such an exhausting but fun star party at Wigwam the night before. Attendance: Bob S, William, and Mike showed up from PAS. We had two RSVP's and they showed up. A third came and went, but he hadn't RSVP'd, and no one knows who he was. However, he said he would bring his scope to the May 2 Workshop. And Mike brought his friend Joe with him.

I'd like to thank Mike for sharing his meteorites. Bob was awesome in setting up the tables. And because the scope that was there was similar to mine, William and I helped Gilbert with his scope. The other attendee was Ken, who had questions about various types of time measurement, such as sidereal time. I wish to WELCOME the new member, Gilbert to PAS! It was a very nice workshop. We had a ton of handouts available. See the photos on line in the PAS Photo Gallery. The pictures of this event are combined in the Photo Gallery with those of the Workshop from two weeks ago on April 4.

We hope to see more PAS members at the next Bookman's Telescope Workshop, as we need more Telescope Teachers. If you know how to work, collimate or use a telescope, you should be one of the PAS Telescope Teachers, and you are in high demand at these events and at the Workshops at PVCC. We hope to see you there!

Wigwam Creek School Star Party Review April 17

By Terri, Event Coordinator

This was a fun event. Yes, we were clouded out, but it didn't seem to matter much to the attendees. They seemed to enjoy it, tremendously. Eric, my contact at the school, was so awesome! I appreciate all his help in setting up this event. And the pizza for dinner was tremendously appreciated. I wish to thank those PAS Members who attended: Bette, Ed, Bruce, Bob S., Chris, Greg, Joe, Renee, Kat, Mike, Sam, Frank, William, and Bob C. Thank you all for helping to make this an awesome event.!

Here are some highlights from this event:

We arrived about 3pm to for set up. Some of us were later than others. The plan was to arrange the evening viewing in two rows of four scopes to make it easier for the attendees to go up one aisle and back down the other. So, we started getting arranged that way. We set up the EZ-Up canopies, two of them. Eric brought tables and chairs. We borrowed three tables for the handouts. Renee sat down at one end of the tables and helped hand out our blue PAS plastic bags. The idea was that the attendees could use the blue bags to fill up with handouts they wanted to take home. Then another two tables were set up for games with prizes. I want to thank Ed for having a ton of enthusiasm and drawing a crowd to come play his game. He was a bit more generous than I wished him to be, and gave out a prize every time, sometimes two prizes. Ed was working the Planetary game, where you roll a marble up 2 metal poles to try to get to Pluto before falling off the poles. If you reached Pluto, you were awarded a PAS Red Flashlight. If you didn't get to Pluto, you were given a random astronomy poster. It appears that everyone was having a great time with that game. Next to Ed was William, who was doing the Constellation tubes. The idea was to identify at least one constellation and get a prize of a PAS Bookmark. William also was a bit more generous but it appeared everyone was having a great time. Further down the table, one of the awesome teachers at the school, had made a seat for herself doing an electronic astronomy game with the kids. No prizes but it was fun.

Then at the end of the table we found Mike. Of course, as usual, Mike had a crowd the whole time. With him, Bob S. assisted by handing out raffle tickets to those school children who asked Mike a question about meteorites. If no question was asked, a ticket for the raffle of a meteorite was not given. At least, that was the plan. I think Bob was being generous as well. Now, knowing that there were supposed to be 900 kids in attendance, plus their parents and siblings as well as the whole district invited, I was trying not to give away too many prizes too soon in the evening. But, it worked out well. I think we had about 300 of the public in attendance.

We also had an additional scope that showed up. A gentleman named Belthazar attended with his scope and setup a little ways away from the rest of us. He found Mars and was showing it most of the evening, when he could. Thank you for attending and helping out, Belthazar!

Now, the sky. Well, I can't say it was very cooperative. What should have been clouded about 12% according to the last forecast Sam looked at, was to us, 95% cloud cover. Sam was joking that he thinks the weather people were thinking of cloud cover that is 12% thick, not 12% of the sky. Ha ha. It really wasn't funny. But, we did get to see a little of the Sun, for a while, through Sam's and Frank's scopes. And Bruce found the Moon. This impressed the attendees because the Moon could not be seen by naked eye, yet in Bruce's 20” scope, he brought it into view. It wasn't impressive to see, but it was impressive to find. I was able to capture the Moon in the evening hours for about an hour, and I know how much the public likes a colored Moon, so I put a red filter on my scope to bring out the craters. That was the gist of the viewing from my scope. Bruce and Bob C. did an awesome job of keeping everyone looking at something, the best they could.

Then, it got dark and the excitement began. Yes, we had one of those scares. You know the type... where the sprinklers come on, without notice. So, we were doing great with what we had available. I was showing everyone the Moon, and along with that, also showing the demo of why we want to view the Moon at any time other than Full Moon (to get the full effect of the depth of the craters). And then the sprinklers popped up. What's that noise? Quick, pack up!

So, we gathered all our stuff. We had everyone running around packing up the handouts, the scopes, etc, just in case the sprinklers were to come our way. That happened about 7:45 that night. We were packed up and ready to leave by 8:45, but had to do the meteorite raffle. So, we did it early, and gave away three meteorites to the winners, who were all boys. I hope they enjoy the meteorites. And then we hopped in our vehicles and were out of there by 9:15.

I do wish to thank Eric for inviting us to have the star party. He and I will soon be setting up the next event. He only wants an evening viewing for the next one. So, if you want to do a star party at Wigwam for Eric, be sure to sign up for it. He assured me that he will make sure the sprinklers do not come on again. He had a talk with someone about it and they said it can be turned off for a star party for one night. So, we look forward to helping Eric do another star party in the next school year. Thanks again to all the volunteers and everyone who helped and was there to support the event, even though it was so cloudy, we should have probably canceled the event. But, read the reviews below. These people totally enjoyed what we provided. We were a success!!! See you at the next Wigwam star party. !!! ***

THANKS FROM WIGWAM CREEK SCHOOL

By Eric Santos

Terri, I can't thank you and your group enough. This event went over really well, the principal was very happy with it, the attendees have been raving about it, you guys did a great job. Also, the building engineer sends his apologies for the sprinkler scare. He and I both dropped the ball on that one. I am hoping we can bring you back next year at least once, if not twice! Please send my thanks to the team! ***

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THANKS FROM WIGWAM ATTENDEE

By Mindy Schlag, Teacher

I just wanted to let you know that we came to the star night on Saturday and my eight year old son will not stop talking about it. Thank you for providing an opportunity for kids who love astronomy to come experience this. Great Job!

Mrs. Mindy Schlag
Corte Sierra
3rd Grade Teacher***

ANOTHER WIGWAM ATTENDEE'S THANKS

By Robert Fleming, Teacher

Wonderful "Star Party". My granddaughter loved Meteorite Man! We will be back next year!
Robert Fleming
7B History Teacher
Wigwam Creek Middle School
LESD # 79 ***

Arizona Sky

By Leah Sapir

This month, the summer constellation Hercules is rising in the east, bringing its prominent globular cluster M13 back to our sky. In dark-sky sites, M13 is visible even to the naked eye as a "fuzzy star". It was discovered by Edmond Halley in 1714, and was included in Charles Messier's list in 1764. With his small telescope, Messier described M13 as "a nebula containing no stars". But in 1789, William Herschel examined it with a much larger telescope, and was the first to recognize that M13, and other globulars, were actually composed of stars – many, many stars! – compressed by their mutual gravity into a spherical shape.

M13 contains 600,000 solar masses. The estimates for the actual number of stars vary from a few hundred thousand to over a million, depending on whether the estimator assumes that the stars are larger or smaller than the sun. M13's total diameter is about 150 light years, but most of the stars are located within the central 2/3 of that. On average, the stars are about one light year apart, but the density of stars increases greatly (or should we say, astronomically?) at the center of the cluster, where the average is 3 stars per cubic light year.

For comparison, in our "neighborhood" the stars closest to the sun are the Alpha Centauri triple-star system, 4 light years away. The next closest star, not counting a few almost-invisible red dwarfs, is Sirius at 8 light years away. But in a radius of 8 light years, the center of a globular cluster would have at least 6000 stars!

When stars form, their initial mass determines their future temperature and lifetime. Stars that start out with more mass will compress and fuse their hydrogen fuel more efficiently; they will burn hotter and use up their fuel more quickly, even though they started out with more of it. Smaller stars burn their fuel more slowly and last longer.

A star's color indicates its temperature: blue stars are the hottest, with a surface temperature of 15,000 to 40,000 degrees C; yellow stars, like the sun, are intermediate, with a temperature of 4000 to 10,000 degrees C; and red stars are coolest, relatively speaking, with a surface temperature of "only" 2000 to 3000 degrees C.

We can use this information to predict the star's lifetime. The most massive stars are hot and blue, and they will generally use up all their fuel within 100 million years or less; yellow stars can last for one to ten billion years; and red stars can last even longer - theoretically, for up to a trillion years, but since the universe isn't that old, none of them have burnt out yet.

Globular clusters are very old, in the neighborhood of 12 to 14 billion years, so their stars are generally red and yellow stars. But some of the stars in M13 and other globulars are blue stars, and the question is how they could manage to last so long. These stars are called "blue stragglers", and they are apparently the result of

M13 with NGC 6207 and IC 4617, photographed by André Gonçalves (http://astro-andregoncalves.blogspot.com/) and featured on www.astronomy.fm

Globular cluster M5

Arizona Sky

a merger or mass transfer between stars in multiple star systems. In the dense conditions of a globular cluster, two old yellow stars can merge to form a larger star; and the larger star will then burn hotter and bluer.

M13 is the easiest globular to find, since it is right on the western edge of the "keystone" shape of Hercules; but there are several more nice globulars in our spring sky. M3 is in Canes Venatici, about halfway between Arcturus and Cor Caroli. (The curved handle of the Big Dipper points toward Arcturus: "follow the arc to Arcturus". Cor Caroli is nestled inside the Big Dipper's handle; if the Big Dipper's handle were a fan, Cor Caroli would be the handle of the fan.)

M5 is in the faint constellation of Serpens, but we can again use Arcturus and Cor Caroli to find it: if we draw a line from Cor Caroli to Arcturus, and continue the line for the same distance (about 25 degrees) past Arcturus, we will come to M5.

M3 and M5 are both larger than than M13, each one having a mass of about 800,000 solar masses compared to M13's 600,000. Their distances are similar: M5 and M13 are about 25,000 light years from us, and M3 is slightly farther.

M5 was first discovered by German astronomer Gottfried Kirch and his wife in 1704, while they were tracking a comet. Messier was unaware of this previous viewing when he independently discovered M5 in 1764. Messier also discovered M3 in 1764, his first unique discovery, a few weeks before he found M5. It is said that M3 was the the impetus for Messier's list; after he had seen two other comet-like fuzzy objects that weren't really comets, it was the third one that convinced him to compile a list of fuzzy objects for comet-hunters to avoid. (Although the comets that Messier eventually discovered are now long gone, today Messier's list of non-comets is the "top 110 list" of interesting objects for amateur astronomers to observe. Messier wanted to become famous for discovering comets, but it was the list of non-comets for which he is famous to this day.)

Spiral galaxy NGC 6181

Opinions are divided as to which of the three globulars is "best". All three are visible in binoculars as a fuzzy spot; and with a small telescope, some of their stars can be resolved. Why not get out your binoculars or telescope on the next clear night, take a look, and decide for yourself which one you like the most?

Besides the famous M13, Hercules has some nice galaxies too. For example, NGC 6207 is an edge-on spiral galaxy about 55 million light years away; in the sky it is only half a degree northeast of M13. In photographs it has a pinkish-blue color, indicating emissions nebulae where young stars are forming. In this picture of M13, NGC 6207 can be seen faintly at the upper left. If you look closely, you can also see a tiny more-distant galaxy about halfway between M13 and NGC 6207: it is IC 4617, estimated to be about 500 million light years away!

The two stars near M13 in the picture (which are also visible in binoculars) are HD 150998 on the left, a type-K orange giant 1800 light years from us, and HD 150679 on the right, a type-A white star at a distance of about 400 light years.

At the southern end of Hercules is NGC 6181, a nice face-on spiral galaxy about 100 million light years away. NGC 6207 and NGC 6181 were discovered by William Herschel in 1787 and 1788, respectively. IC 4617 was discovered by E. E. Barnard in the 19th century.

Closer to home, Mars and Saturn are still up for most of the evening. Mars sets around 1 am, and Saturn sets around 3 am. Venus is a nice evening star and will be up till at least 9-10 pm.

Jupiter, Uranus, and Neptune are still morning stars, but rising earlier (around 3 am). Mercury will be visible as a morning star after midmonth, rising around 4:30 am.

On May 9, the crescent moon will make a nice grouping with Jupiter and Uranus in the east before sunrise. On May 15 and 16, the moon will pass into the evening sky and will be seen close to Venus.

Mars is moving out of the Beehive cluster and approaching Leo; but on May 19, Mars and the moon can be seen only a few degrees from the Beehive. On May 22, the moon will be seen near Saturn.

Star Party & Potluck At Mike's On May 29th

By Terri, Event Coordinator

Mike will be hosting a star party / potluck at his home in Carefree on May 29th. PAS members are invited to bring a food and drink to share. This will be an awesome night to enjoy Venus, Mars, Saturn and the Moon. RSVP is required by noon the day of the event. Potluck begins at 6pm. Please arrive prior to dark, at 8:45, so not to disturb those viewing through telescopes. Movies and overnight sleeping to follow star party. See you there!!! ***

Mike Marron's 2010 Summer Lecture Series, Potluck, And Star Party

Written by Mike, Edited for newsletter by Terri

Meet at Mike's home in Carefree at 4pm. RSVP is required with Mike by noon the day of the lecture. Arrive early, as parking may be limited. RSVP can be by email: PrimeFactorY@q.com or phone: 480-488-3031 / leave message. Lectures are for PAS Members ONLY, or by invite from Mike. Call to find out if you may attend. Bring a food and drink for the potluck to share during the lecture. A Star Party follows the lecture, and then movies into the morning. If you plan to spend the night, bring needed items. Lectures may run 3+ hours.

June 19: Planetary Physics
July 17:Stellar Physics
August 21: Galactic Tails of Plasma

Mike writes: These lectures are related. The physics covered will be built from one lecture to the next. They may be long, but I have a lot of new ground to cover. Presented in simple terms, only a slight background in astronomy is needed, but even an expert can learn a vast amount of new information and techniques. I destroy the misguided and limiting theories of the twentieth century by staying with proven physical principles. You are welcome to challenge the concepts and get clarifications during the lectures.

Just bring food for the potluck, a sense of awe, and you will learn how to solve, on your own, the mysteries of physical evolution. There will be breaks in these talks and star parties afterward. You are free to wander my ranch to see the birds, animals, and native cacti if you need a break. ***

May 2010 PAS Meeting

By Terri, Event Coordinator

For our May PAS Meeting: Plan for a super guest speaker as well as PAS Elections!!! Do you wish to run for PAS Office? We could use some new blood. Our current line up of officers is: Prez: Rod Sutter, Vice Prez: Terri Finch, Editor: Don Boyd, Treasurer: Mike Marron, Host: John Pulis, Webmaster: Chris Johnson, Rocketry Liaison: Jerry Belcher, and WOW Contact: Chet Schuler. You can visit the PAS Constitution pages on our site and read up about what you would be expected to do to in any of these positions. Currently, several officers have said that they are willing to keep their positions unless someone else wants to run for office.

Also, we are making it a party! In the Library, we will keep quiet, but we will have snacks galore. Bring a snack and drink to share. Terri will bring the needed plates, napkins, plastic ware, cups. If someone wants to bring a cooler with a bag of ice, that would be appreciated. If everyone brings one snack to share, we will have enough for the night. Let's make it the "End of the PAS Season" PARTY! Water will be provided by PAS. ***

NO JUNE PAS MEETING

By Terri, Event Coordinator

Due to unknown reasons, Dave Hellman will not be able to do a presentation for PAS at the June 3rd PAS Meeting. Therefore, there will be NO JUNE 3 PAS meeting this year. Enjoy your summer! See you in the Fall! ***

Bookmans Telescope Workshop April 4 Review

By Terri, Event Coordinator

It was an awesome little workshop. Terri, William and Don hosted the event. Don was awesome! He helped Allen with his scope by collimating it, aligning it, and having all the right tools and supplies to help in the best possible way. Allen brought his C5, and while there, he took care of many incoming calls about the earthquake that had just happened in California earlier that day. Allen will be joining the club and will need assistance using his scope by evening. We welcome Allen! Many thanks to Don. He comes very prepared and is super helpful. We hope to see all of you at the next Telescope Workshop. ***

April Fools Joke In April 2010 Newsletter

By Terri, Event Coordinator

Good afternoon my favorite PAS People....I wish to let you all in on the joke. For April Fools, the editor of PAStimes, with help from the proof readers, Terri and Matt, got together for the 2010 April Fools Joke. What we came up with served two purposes.

Sam, you passed the test! It appears that other than the proof readers, Sam is the only one who actually read and verified he read, by asking me, at the PAS meeting, "Did I miss the special announcement that is supposed to happen tonight?" On page 8 in the April Newsletter, there is a special announcement posted. Those of you who didn't read the newsletter, didn't ask me about this special announcement. I'm sorry, the rest of you did not pass the test. This special announcement holds two answers.

1) It proves our members are not reading the entire newsletter prior to coming to the PAS meetings. This is sad...

2) It proves that I can count on Sam to ask the right questions.

There was no special announcement. It was part of the April Fools joke, but it was a test to see how many members read the newsletter.

I'm sorry the rest of you did not pass the test. Maybe next time April Fools Day falls on the PAS meeting, you will know to look for and expect at least one joke in the newsletter. Better luck next time. READ THE NEWSLETTER. That's how we get the info out to the membership. Better luck next time! ***

"The Great Debate" of April 26, 1920

By Leah Sapir

We live in a spiral galaxy, the Milky Way; our galaxy is only one of the billions of galaxies of the universe. Nowadays this is common knowledge, but it wasn't so long ago that nobody knew it. In April 1920, the Smithsonian Museum of Natural History held a debate between two leading astronomers, Harlow Shapley and Heber Curtis, regarding the size of the universe and the nature of the so-called "spiral nebulae" that had been observed in the sky.

In the 18th century, astronomers such as Charles Messier and William Herschel scanned the skies with with their telescopes and recorded the location of thousands of fuzzy objects, all referred to as "nebulae"; this included all kinds of deep-sky objects, including what we know today to be star clusters, diffuse nebulae, and galaxies.

In the 19th century, Lord Rosse (William Parsons, 3rd Earl of Rosse) built a telescope with a 72-inch aperture, which he called the "Leviathan". It was the largest telescope in the world at that time. This enabled him to see spiral structure in M51, today known as the Whirlpool Galaxy. Within a few years, Lord Rosse had made a list of 14 "spiral nebulae"; however, the significance of the spiral shape was not yet known.

Spectroscopic studies in the 19th century enabled astronomers to sort the deep sky objects into different categories. For example, star clusters had the same continuous spectra as individual stars; while planetary nebulae and diffuse nebulae showed the spectral lines of specific elements. When the astronomers took the spectra of the "spiral nebulae", they found a continuous spectrum, showing that the "spiral nebulae" were composed of stars.

Thomas Wright, an English astronomer, theorized in 1750 that some of the "nebulae" that we see were in fact distant "Milky Ways". This theory was also adopted by the philosopher Immanuel Kant, who referred to them as "island universes". But not all astronomers accepted this theory. Even at the beginning of the 20th century, astronomers had still not agreed as to whether the "spiral nebulae" were, in fact, separate objects outside the Milky Way, or simply deep sky objects in our own galaxy, such as solar systems being formed.

One of the tools that helped determine the true nature of the so-called "spiral nebulae" was "Cepheid variables" – a type of variable star whose luminosity cycle resembles that of the prototype, Delta Cephei. In 1912, Henrietta Leavitt at the Harvard Observatory was studying variable stars in the Magellanic Clouds, and noticed that the brighter Cepheid variables had a longer cycle of variation. Therefore, the length of the cycle could indicate the star's absolute magnitude; and by comparing this to the visible magnitude, we can calculate the star's distance. In 1915, Harlow Shapley at Princeton University measured the cycles of Cepheid variables and RR Lyrae variables in globular clusters, and then diagrammed their location in the sky. He found that the globular clusters are clustered around a point in the direction of Sagittarius, and (correctly) assumed that this was the center of the galaxy. According to his calculations, the Milky Way Galaxy was about 200,000 light years in diameter, and the sun is located about 100,000 light years from the center. (Today we know that the Milky Way is actually around 100,000 light years in diameter, and the sun is about 25,000 light years from the center. Shapley overestimated because he didn't realize that interstellar dust made the stars seem fainter – and farther – than they really are.)

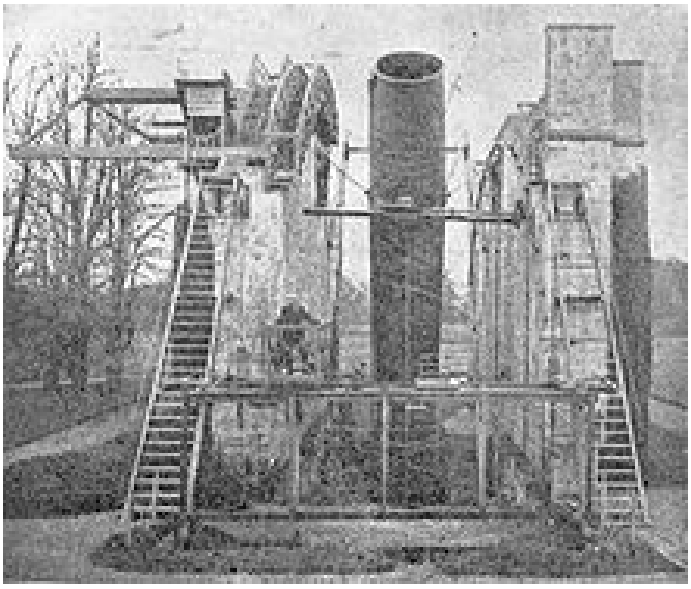
In 1912, Vesto Slipher, at Lowell Observatory in Flagstaff, measured the spectra of "spiral nebulae" and found that most of them had a very high red-shift, which would indicate that they are moving away from us very fast. According to Slipher's calculations, many of the "spiral nebulae" were moving faster than the escape velocity of the Milky Way. (However, a few, such as M31, were found to have a blue-shift, i.e. moving towards us.)

In 1917, Heber Curtis at the Lick Observatory measured the luminosity of novae in M31, the "Andromeda nebula" (as it was called at the time) and found that they were about 10 magnitudes fainter than novae in the Milky Way. He therefore estimated the distance of M31 as 500,000 light years.

On April 26, 1920, exactly 90 years ago, the Smithsonian Museum held "The Great Debate" between Harlow Shapley and Heber Curtis. Shapley believed that the Milky Way was the whole universe, and the "spiral nebulae" were part of it. He gave as an example a nova that had been seen in M31, which was brighter than the nucleus of M31; how could the nova have been so bright if M31 were a separate, distant galaxy? (He didn't know that it was a supernova.) Curtis believed that the "spiral nebulae" were "island universes". He pointed out their large redshift, and also that we can see more novae in M31 than in the Milky Way. If M31 were part of the Milky Way, why would it have more novae than the rest of the Milky Way?

The "Great Debate" did not lead to any conclusions. Each astronomer wrote a paper about a month later, summarizing his own view. But a few years later, Edwin Hubble used the 100-inch telescope at Mt Wilson to observe M31, and found Cepheid variables. He measured their apparent luminosity and the length of their cycles, and his calculations showed that M31 must be at least 1.5 million light years away – definitely outside the Milky Way!

Today we know that M31's distance is closer to 2.5 million light years, and the galaxies of the Virgo cluster are 40 million light years away. The Hubble Space Telescope Ultra Deep Field has photographed galaxies as far as 12 billion light years from us. The universe is a much larger place than astronomers imagined only 90 years ago.



Lord Rosse's telescope, the "Leviathan" (picture credit: www.wikipedia.com)

NASA Space Place

A Rock Hound is Born

It's tough to be a geologist when you can't tell one rock from another. Is that a meteorite or a chunk of lava? A river rock or an impact fragment? Houston, we have a problem!

It's a problem Spirit and Opportunity have been dealing with for the past six years. The two rovers are on a mission to explore the geology of the Red Planet, yet for the longest time they couldn't recognize interesting rocks without help from humans back on Earth.

Fortunately, it is possible to teach old rovers new tricks. All you have to do is change their programming—and that's just what NASA has done.

"During the winter, we uploaded new software to Opportunity," says Tara Estlin, a rover driver, senior member of JPL's Artificial Intelligence Group, and the lead developer of AEGIS, short for Autonomous Exploration for Gathering Increased Science. "AEGIS allows the rover to make some decisions on its own."

Estlin and her team have been working for several years to develop and upload increasingly sophisticated software to the rovers. As a result, the twins have learned to avoid obstacles, identify dust devils, and calculate the distance to reach their arms to a rock.

With the latest upgrade, a rock hound is born.

Now, Opportunity's computer can examine images that the rover takes using its wide-angle navigation camera (NavCam) and pick out rocks with interesting colors or shapes. It can then center its narrower-angle panoramic camera (PanCam) on targets of interest for close-up shots through various color filters. All this happens without human intervention.

The system was recently put to the test; Opportunity performed splendidly.

At the end of a drive on March 4th, the rover settled in for a bit of rock hunting. Opportunity surveyed the landscape and decided that one particular rock, out of more than 50 in the NavCam photo, best met criteria that researchers had set for a target of interest: large and dark.

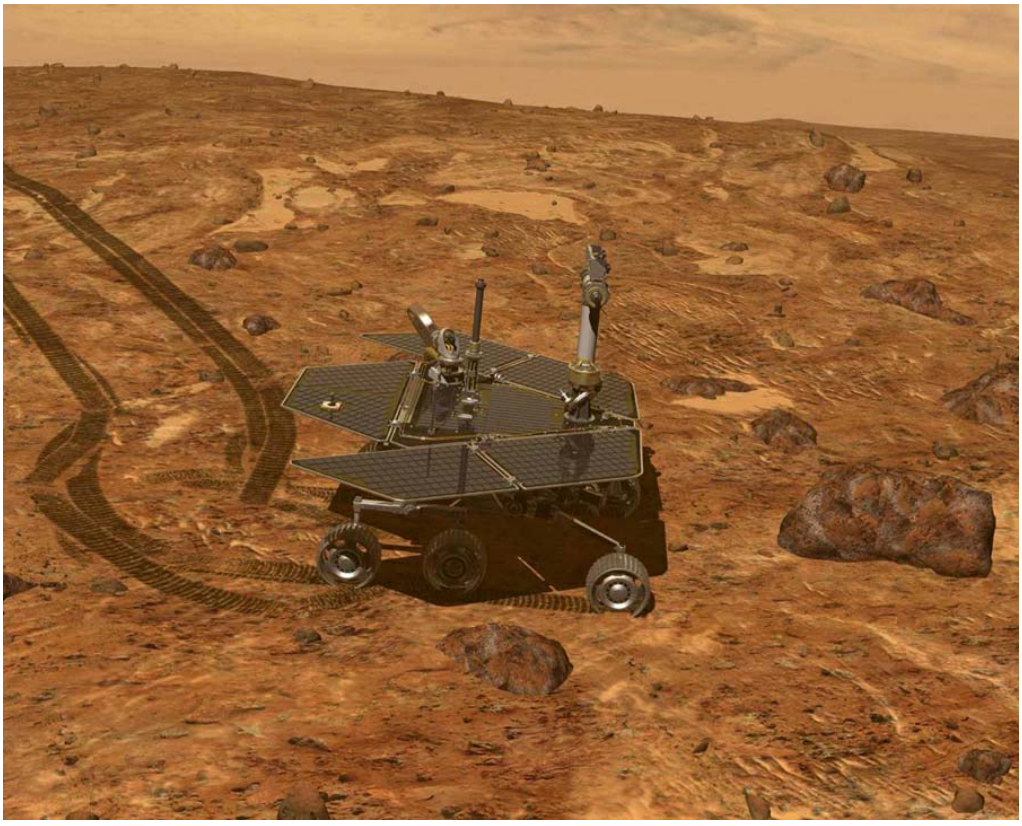
"It found exactly the target we would want it to find," Estlin says. "It appears to be one of the rocks tossed outward onto the surface when an impact dug a nearby crater."

The new software doesn't make humans obsolete. On the contrary, humans are very much "in the loop," setting criteria for what's interesting and evaluating Opportunity's discoveries. The main effect of the new software is to strengthen the rover-human partnership and boost their combined exploring prowess.

Mindful that Opportunity was only supposed to last about six months after it landed in 2004, Estlin says "it is amazing to see Opportunity performing a brand new autonomous activity six *years* later."

What will the rock hounds of Mars be up to six years from now? Stay tuned for future uploads!

Learn more about how the AEGIS software works at http://scienceandtechnology.jpl.nasa.gov/newsandevents/newsdetails/?NewsID=677. If you work with middle- or high-school kids, you'll find a fun way to explore another kind of robot software—the kind that enables "fuzzy thinking"—at http://spaceplace.nasa.gov/en/educators/teachers_page2.shtml#fuzzy.



Opportunity spots a rock with its NavCam that its AEGIS software says meets all the criteria for further investigation.

Chaparral H.S. Star Party

By Bob Christ

Don Boyd, Mike Marron, and I supported the Chaparral High School star party on April 13th. Hosted by Chaparral teacher Rob Mattisinko, some 40 freshman and sophomore students that take Rob's Earth Sciences class attended the event.

Rob structured the event such that there were "4 stations" that each student had to visit: planets, constellations, nebula, and meteorites. The students were armed with a sign-off sheet to verify they had visited each station and we used rubber stamps that Rob had "appropriated" from his young daughter to mark these sheets.

Mike, of course, was Meteorite Man, Don manned the planet viewing station (Venus, Mars, and Saturn), Rob described constellations, and I displayed M42 and assorted open clusters.

The event was held in an alternate location on the school's property because of event scheduling, and while the sky cooperated rather nicely, lights from their major playing field to the SSW really lit up the area – making fainter objects impossible to see. The sign-off sheets were two-sided, and it was so bright that there was no issue figuring out which side of the page to stamp.

It was clear the students had been schooled in astronomy-related matters, and the event allowed them to expand on that knowledge. They were engaged, engaging, and I learned that the term "that's sick" is a very good thing – the equivalent of "holy cow" and "holy mackerel."

New Moon was April 14th (the following day) so the moon was not available to view before nightfall. The event concluded before astronomical twilight at 2025 hour.

Thank you for the Chaparral HS star party

By Robert Mattisinko

Bob, Don, and Mike -- a big thank you for working with the students here at CHS. Terri, thank you for coordinating the event. We had a great turnout and a wonderful night!

Have a great week, Rob ***

Quest to Join the Herschel 400 Club

By Bob Christ

The pursuit to complete observing programs is a fun and focused means to learn the sky, and improve one's viewing skills.

Examples of such programs include logging observations of the 109/110 objects identified by Charles Messier (objects he deemed not worthy of effort because they were not comets), the Best 110 NGC (New General Catalog) targets, the Best 110 Double Stars, the Best 110 Urban Sky targets, and Moon observing programs. Depending on the program and sponsoring entity, placards or certificates that can be framed are supplied as achievement rewards.

A challenging program beyond these is the Herschel 400 Club: named after Frederick William Herschel (1738 – 1822), a British Renaissance man and an astronomer particularly noted for his discovery of the planet Uranus.

The program requires one to view, through the eyepiece, and log 400 challenging NGC targets selected by the Ancient City Astronomy Club in St. Augustine, Florida. Targets include: various types of galaxies, planetary nebula, globular clusters, and open clusters (non-intuitively difficult to make out). Today, the program is administered by The Astronomical League in Florida, and PAS is an affiliate of this organization.

When I first started the quest to "join" the Herschel 400 club in March of 2007, I was full of confidence and soon-to-be-realized misguided expectation. Viewing from a dark site is a must, and very early on one of the required targets was a 13th magnitude galaxy that was roughly 4'x2' in size. In spite of its very low surface brightness, I actually found it, yet all I saw was the slightest of "smudges" in the eyepiece by using averted vision – direct vision revealed nothing. Is this what the Herschel 400 Club is about? I was deflated, discouraged, and stopped working on the program.

When I spoke with several experienced amateur astronomers that were members of the Club, I was told that simply finding objects such as this particular galaxy in my scope's aperture was an accomplishment in itself, and that detailing the slightest of characteristics and nuances viewed in the eyepiece was all that was required. My quest continued.

In the late 19th/early 20th centuries in Germany, sporting a Heidelberg scar on one's face (sword induced) was a badge of honor and courage. Joining the H400 Club was going to be my Heidelberg scar. Reinvigorated, I proceeded once again with purpose.

At 11:40 PM, April 14th, 2010, I logged my final target. I had completed the quest that spanned over a period of 3 years and 1 month, and while I wasn't in a particular hurry, I always wanted to continually move forward toward program achievement.

Now to ponder – what's the next viewing challenge?

Congratulations To Bob Christ!!!

By Terri, Event Coordinator

Congratulations, Bob, on completing the Herschel 400 list!!! Please help us congratulate Bob on this awesome achievement at the May PAS meeting. Rod will be giving the award to Bob provided by the Astronomical League. ***

PAS Photo Gallery

By Terri, Event Coordinator

The PAS Photo Gallery is an awesome way to see what happened at an event, whether you attended the event or not. Be sure to visit. Photos from many events have been recently posted. My goal is to get as many photos as I can on line so everyone in PAS can enjoy them. Please take a look today! ***

Upcoming Summer PAS Events

By Terri, Event Coordinator

JUNE

June 5: Virtual Star Party at Chris's home in Goodyear starting at 9pm. RSVP is required with Chris. Bring your laptop. Sign up to take photos through Chris's scope in Mayer, and then plan another evening to learn how to process the photos you have collected. PAS Members only!

June 12: Cuttin' Edge Observatory Dark Sky site in Mayer. Chris opens up his observatory to those PAS Members who wish to enjoy a night of super dark skies. Please RSVP with Chris, required, and arrive at least an hour prior to sundown. Plan to spend the night, bring proper snacks, drinks, bedding.

June 17: Telescope Training Workshop at PVCC. 7pm to 10pm. Indoors, learn to use your telescope by daylight. Take it outdoors to learn to use it by night. Night set up will be by Telescope Dome, weather permitting. RSVP is with Terri. 7:30p to 10pm. Everyone Welcome!

June 24: PAS Meeting of the Minds- this is the business portion of PAS. How does the club function, what upcoming events are we planning, what will you see next at PAS? All these questions and ideas are shared at the MOM's. Everyone is welcome, but please do not bring children to this meeting. It is a serious discussion, but we do have a whole lot of fun!

JULY

July 3: Virtual Star Party at Chris's home in Goodyear starting at 9pm. RSVP is required with Chris. Bring your laptop. Sign up to take photos through Chris's scope in Mayer, and then plan another evening to learn how to process the photos you have collected. PAS Members only!

July 10: Cuttin' Edge Observatory Dark Sky site in Mayer. Chris opens up his observatory to those PAS Members who wish to enjoy a night of super dark skies. Please RSVP with Chris, required, and arrive at least an hour prior to sundown. Plan to spend the night, bring proper snacks, drinks, bedding.

July 25: Telescope Training Workshop at Bookmans 3:30pm to 5:30pm. RSVP is required with Terri. Bring your telescope to Bookmans back room and learn to use it by daylight. Then, join PAS at a public star party and use what you learned. If you get stuck, there should be enough telescope operators to assist you while you learn more in the evening hours.

July 29: PAS Meeting of the Minds- this is the business portion of PAS. How does the club function, what upcoming events are we planning, what will you see next at PAS? All these questions and ideas are shared at the MOM's. Everyone is welcome, but please do not bring children to this meeting. It is a serious discussion, but we do have a whole lot of fun!

July 31: Virtual Star Party at Chris's home in Goodyear starting at 9pm. RSVP is required with Chris. Bring your laptop. Sign up to take photos through Chris's scope in Mayer, and then plan another evening to learn how to process the photos you have collected. PAS Members only!

AUGUST

Aug 5: Saturn, Mars & Venus Star Party at PVCC 6pm to 10pm. RSVP is required with Terri or Rod. Come see three planets this night on the PVCC campus. Weather Permitting.

Aug 7: Cuttin' Edge Observatory Dark Sky site in Mayer. Chris opens up his observatory to those PAS Members who wish to enjoy a night of super dark skies. Please RSVP with Chris, required, and arrive at least an hour prior to sundown. Plan to spend the night, bring proper snacks, drinks, bedding.

Aug 12: Telescope Training Workshop at PVCC. 7pm to 10pm. Indoors, learn to use your telescope by daylight. Take it outdoors to learn to use it by night. Night set up will be by Telescope Dome, weather permitting. RSVP is with Terri. 7:30pm to 10pm. Everyone Welcome!

Aug 13: Perseids Meteor Shower & Star Party at PV Park 6pm to 10pm. RSVP is required with Rod. Come see the meteor shower and view through telescopes. When park closes at 10pm, go home and enjoy more meteors from your back yard.

Aug 26: PAS Meeting of the Minds- this is the business portion of PAS. How does the club function, what upcoming events are we planning, what will you see next at PAS? All these questions and ideas are shared at the MOM's. Everyone is welcome, but please do not bring children to this meeting. It is a serious discussion, but we do have a whole lot of fun! ***

NON PAS EVENTS FROM MAY - END OF AUGUST

By Terri, Event Coordinator

More info on these events can be found in the Private PAS Calendar. Feel free to contact the people hosting the events for more info. Do not ask PAS for info, it isn't our event.

May 12 - 16: Riverside Telescope Makers Conference

May 21-22: Rocket Launch

Jun 5 - 12: Grand Canyon Star Party

Jun 26: Rocket Launch

Jul 10-14: Golden State Star Party

Jul 24: Rocket Launch

Aug 28: Rocket Launch ***

What Will Happen in 2012?

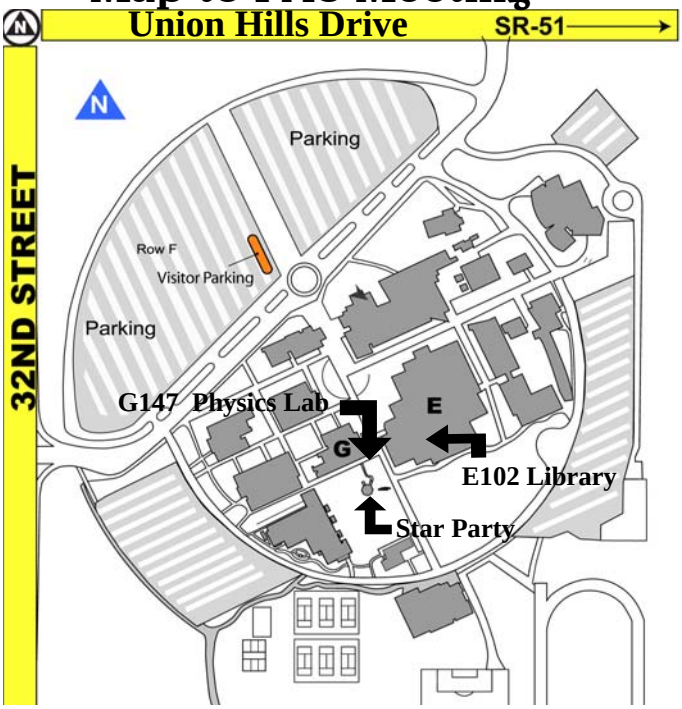
by Leah Sapir

Recently we've been getting some questions about the "2012 rumors", and "Planet X/ Nibiru". Probably because of the hype for the recent movie "2012", people have been hearing about these things and wondering if there is any truth to the rumors.

The fact is: NOTHING ABOUT THESE RUMORS HAS ANY TRUTH AT ALL IN THEM! Not even a little! They are all one great big hoax. Nothing dangerous will happen in 2012. The Mayans did not "end their calendar" with December 2012. There is no large unknown planet heading for the Earth. In recent years, both amateur and professional astronomers have been watching the skies for even tiny asteroids and "near earth objects", so if there were a large planet (or even a small one) heading towards us, we would already have seen it.

There is a very good website, www.2012hoax.org, which has detailed explanations of why all the "2012 rumors" are not true. It is recommended reading for everyone.

Map to PAS Meeting



See page 2 for more information

PVCC Telescope Workshop Review April 15

By Terri, Event Coordinator

It was a different kind of night. The telescope team hurried to set things up. Three of the five public RSVP's showed up. I'd like to thank those who attended: Allen, Terry and Ken. I'd also like to thank the PAS Teachers we had this evening: Chris, Rod, Greg, and Rod. Without the PAS Volunteers to help the Public RSVP's, this event might not have been as successful as it was. It began around 7 pm, when the room was vacated by the class that ends at 7 pm. Then Bette and Terri set up the handouts. Three tables of handouts were available. Mike brought his meteorites. Chris brought a 5" Tak for display, plus some collimation items and an awesome little photo frame made by Apple, on which he displayed his astrophotography. I think he called it the I-touch Pad. The evening went smoothly, once things were set up, and the public RSVP's seemed to be pleased with the help PAS provided. The evening also started out clouded over, so the three telescopes began in G-147. About 7:45, the sky cleared and we moved outdoors. I wish to thank Dave for allowing us to have this event. We hope to see more Telescope Teachers at the next event!!! ***

May

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2 Bookman's Free Telescope Workshop	3	4	5 Imagine Elementary School star party	6 PAS meeting	7	8 Virtual Star Party
9	10	11	12	13 PVCC Telescope Workshop	14	15 Cuttin' Edge Observatory
16	17	18	19	20 PVCC Star Party	21	22
23 Bookman's Free Telescope Workshop	24	25	26	27 MEETING OF THE MIND	28	29 Star Party & Potluck at Mike's
30	31					

Don Boyd
PAStimes Editor
701 W. Del Rio St.
Chandler AZ 85225

To:

PAS Speaker Line-up

By Terri, Event Coordinator

Sep 2: David Williams - Topic: TBA
Oct 7: Jenny Neureuther - Topic: X-ray Astronomy
Nov 4: Mike Marron - Topic:Astro Events That Can Kill Humanity in the next 10 Thousand Year

Many more awesome speakers to follow!
If you have a suggestion for a speaker, email Events@pasaz.org

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What's Up For May?

By Rod Sutter, PAS President

Planets

Name	Date	Rise	Set
Mercury	05-1-09	05:26	18:36
Venus	05-1-09	07:08	21:13
Mars	05-1-09	11:57	01:40
Jupiter	05-1-09	03:29	15:16
Saturn	05-1-09	15:34	03:52
Uranus	05-1-09	03:44	15:43
Neptune	05-1-09	02:15	13:13
Pluto	05-1-09	22:51	09:19

All Times Arizona Time

May 15 2009

Sunrise: 06:31
Sunset: 20:25

Full:April 28

Q3:May 6

New:May 14

Q1:May 21