

# PAStimes

Phoenix Astronomical Society  
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Solar Eclipse of May 20, 2012  
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## Arizona Sky : What in the World is a Solar Eclipse?

By Leah Sapir

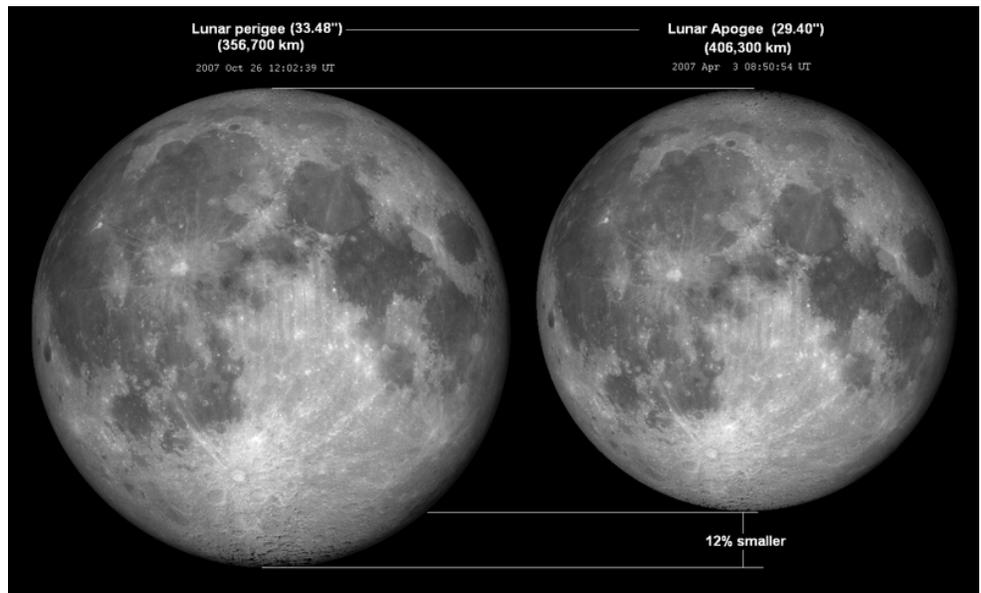
In the Spring of 2012, Arizona viewers were treated to two rare astronomical events: an annular solar eclipse on May 20, and a transit of Venus on June 5.

There is a certain similarity between the two events - both happen when another object moves between the Earth and Sun. For a solar eclipse, that object is the Moon; for a transit, the object is Venus (or Mercury, for a Mercury transit).

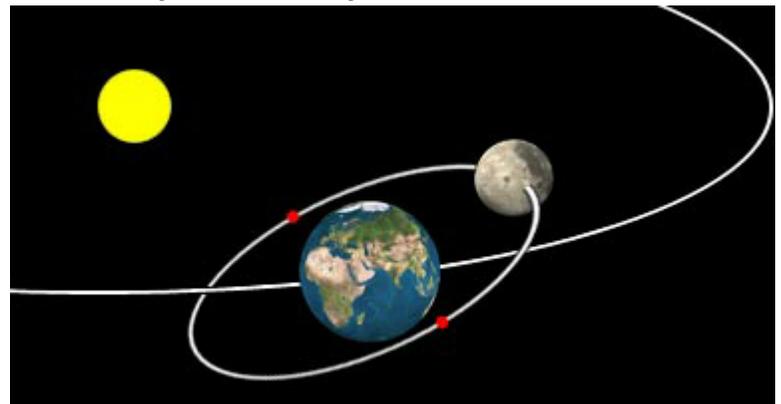
Since the Moon is so much smaller than the Sun, why does the Moon seem to completely block the Sun during a total eclipse? This is due to a strange coincidence regarding the relative size and distance of the Sun and Moon. Although the Sun's diameter is about 400 times that of the Moon, the Sun is also about 400 times as far away from us. As a result, the angular diameter of the Sun and Moon (the amount of space they appear to take up in the sky) is about the same - about  $\frac{1}{2}$  of a degree.

But even this is not the whole story. The truth is that the Earth's and Moon's orbits are not perfect circles - they are somewhat elliptical. So while the Earth's average distance from the Sun is 93 million miles, the actual distance can vary from around 91.4 to 94.5 million miles, depending where the Earth is in its orbit. Similarly, the Moon can be anywhere from 221,000 to 252,000 miles from Earth.

When the Earth is a little closer to the Sun, the Sun looks a bit larger than usual; and when they are a little farther apart, the Sun will look a bit smaller. And the same applies to the Moon when it is closer or farther from the Earth. So the upshot is - if an eclipse happens when the Earth is a little closer than average to the Sun (making the Sun appear a bit larger), and at the same time the Moon is a little farther than average from the Earth (making the Moon appear a bit smaller) then the Moon (Continued on page 2)



Comparison of the apparent size of the Moon at its closest and farthest points.  
picture credit: wikipedia



The two nodes, where the plane of the Moon's orbit intersects the ecliptic (plane of the Earth's orbit), are shown in red.  
picture credit: Lee Green, Twin City Amateur Astronomers

# What in the World is a Solar Eclipse?

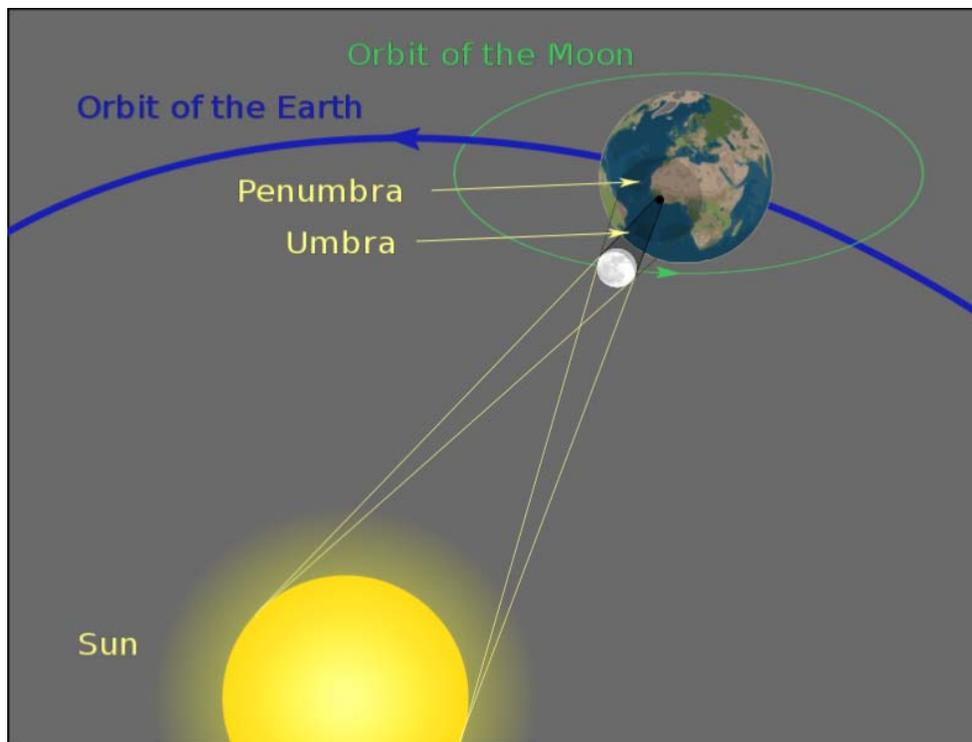
(Continued from page 1) will not completely cover the Sun. It will be too small! And when that happens – we get an annular eclipse: an eclipse that ought to be a total one, but since the Moon is too small to fully cover the Sun, we will see a “ring of fire” around the Moon at the maximum eclipse stage. And this is what we witnessed on May 20, 2012.

Now you might wonder – since the Moon orbits the Earth, and passes between the Earth and the Sun every month at the “New Moon” stage, why don’t we get a solar eclipse once a month? The answer is that the plane of the Moon’s orbit is slightly inclined (by about 5 degrees) to the plane of the Earth’s orbit. Even though the solar system in general is more-or-less in the same plane, there are slight differences between the plane of each object’s orbit. The plane of the Earth’s orbit is called the ecliptic – because that is where eclipses take place! And those eclipses can happen only when the Moon’s orbit crosses the ecliptic. There are two points in the Moon’s orbit, called nodes, where the planes intersect; and if the Moon is at one of those nodes when it is in the “New Moon” phase – i.e., when the Sun, Moon and Earth are all lined up together – we will have a solar eclipse. If the Moon is at any other point in its orbit at the New Moon phase, i.e. if it is not at a node, the Moon will pass a little above or below the Sun, but not right in front of it. And similarly, a lunar eclipse will happen if the Moon is at one of its nodes when it is in the “Full Moon” phase.

But despite these strict requirements of position, there are usually at least two solar eclipses per year, if we count both total and partial eclipses; and even total eclipses happen at least once in every year or two. So why is it considered such a rare event? The reason is that since the Moon is so small, it casts a very small shadow on the Earth. Therefore, only the people in a small area, the eclipse path, can see each eclipse. And if that eclipse path happens to be “in the middle of nowhere” then only those who specially travel to that location will see it.

The Moon’s shadow actually has two parts: the small, dark umbra, which is only about 100 miles across; and the larger, fainter penumbra. We can see a total eclipse if we are within the umbra. From the penumbra we can see a partial eclipse.

Since the Earth continues to rotate during the eclipse, the Moon’s shadow travels



Geometry of a solar eclipse (not to scale). picture credit: wikipedia

along the Earth’s surface, forming a path of totality that can be thousands of miles long, but since it is so narrow, the whole eclipse path of the umbra covers less than 1% of the Earth’s surface. We must be within that path of totality (the umbra) to see a total eclipse. If we are outside that path, but within a few hundred miles of it (i.e. if we are within the penumbra) we will see a partial eclipse. How partial? The closer we are to the path of the umbra, the higher percentage of the Sun will be eclipsed. If we are close to the far edge of the penumbra, we will see only a very slight eclipse, and outside the penumbra we will see none at all.

In some cases, the umbra’s path completely misses the Earth, and only a partial eclipse will be visible.

If we are within the umbra’s path, we will also see the whole range of partial phases before and after the total phase, as the penumbra passes over us before and after the umbra. The partial phases can last about an hour, but the total part of the eclipse is only a few minutes as the Earth’s rotation quickly moves us out of the umbra.

In an annular eclipse, the umbra doesn’t actually reach the Earth, and the path of annularity is formed by a part of the shadow called the “antumbra”, which is located past the end of the umbra. As in a

total eclipse, the annular phase lasts only a few minutes.

Another type of eclipse, even rarer than total or annular eclipses, is the “hybrid” eclipse. In a hybrid eclipse, some parts of the eclipse path are in the umbra, and some in the antumbra, due to the curvature of the Earth’s surface. Therefore, in a hybrid eclipse, the view switches between a total and annular eclipse in different parts of its path. The most recent hybrid eclipse was in April 2005, seen from the Pacific Ocean and the northern part of South America; the next will be in November 2013, visible from the Atlantic Ocean and central Africa.

An interesting phenomenon is that lunar and solar eclipses seem to come in pairs or triplets. Often there will be a lunar eclipse about two weeks before or after a solar eclipse. The reason for this: if the Moon is passing through a node during its New Moon phase, it will also be pretty close to the node for a week or two before or after. Therefore, the recent annular eclipse was followed by a lunar eclipse on June 4, the date of the next Full Moon. However, it was just a partial eclipse and it was not visible from the US; it was seen only from the Pacific Ocean.

Unlike a solar eclipse, that can be seen only within a small path of totality, a lunar eclipse can be seen (Continued on page 3)

# What in the World is a Solar Eclipse?

(Continued from page 2) from the whole side of the Earth where it is nighttime – because the Earth's shadow is quite large compared to the size of the Moon. However, the June 4 lunar eclipse happened when it was daytime in the US. The next total lunar eclipse visible from the US will be in April 2014. It

will be followed, two weeks later, by an annular eclipse – which will be visible only from some parts of Australia and Antarctica.

But, don't lose hope! There will be a total solar eclipse crossing the US from coast to coast in August 2017 – mark your calendar! §

## JW Marriott May 20

By Various Authors who experienced this awesome event!

Photos of this event can be viewed at: [http://www.pasaz.org/forums/gallery.php?g2\\_itemId=11114](http://www.pasaz.org/forums/gallery.php?g2_itemId=11114)

Terri Finch writes: It started with arriving at the JW Marriott for the corporate event. I got there 3:30, ½ hour earlier than planned. Had to wait for some cart to come pick us up, originally, but then they decided to let us drive up to where we were setting up. This was definitely a good move on their part. Easier on us, & faster. It was appreciated. So, we did, a few cars at a time. And a few of the Telescope Team, went to, and setup, at the wrong lawn. We were on the Ballroom lawn.

In attendance from PAS were: Joe & Renee Collins, William & Terri Finch, John Miller, Bruce Wurst & Donna Zander, Rod & Sue Sutter, Dewell Howell, Don Boyd, Albert Tucker, Mike Marron, & Eric & Ora Steinberg. We arrived, got set up next to the pink tables (they were pink to start with, & then when the sun set, we were given long black table cloths to hide our equipment cases under.

4pm was the original set up time. Everyone was set up by 5pm. 5:30 the eclipse started. Rod had his PST, Don had solar, Dewell was doing solar, Joe did solar, & John projected the images of the Sun through his scope which had a ccd camera, onto his laptop, took images, & made them into a mini movie. He also did this similar thing for the evening, where he showed M51 in one box on his computer screen, then collected images and stacked them, showing it really well in the second box. Very impressive set up.

6pm the food was available, so we all gathered down by the food, and before we took our box lunch, we sang Happy Birthday to Mike. The Marriott provided him a little piece of cake to enjoy for his birthday. We then all grabbed our lunches, drinks and ran back to watch the eclipse. John & Albert



Photo by Terri Finch at the JW Marriott Solar Eclipse Private Event. This photo shows Bruce Wurst setting up his scope as the Solar Eclipse portion of this event ends & the evening viewing session begins.

provided Mike with additional cupcakes. I gave Mike the bag with the signed birthday card, but didn't see or hear anything about it after that. And the food was awesome. A huge sandwich, either Roast Beef or Turkey, an apple, a Rice Krispie treat, a pasta salad, a choice of drinks including OJ, water, other fruit juices. I was very impressed and pleased with the box lunches. Very good! We enjoyed our food while we watched the eclipse. I brought my solar filter, but with all the running around I was doing, organizing & helping people get set up, I didn't have time to get my filter on my scope in time, so I viewed it through the other scopes.

It was hot and sunny, but what was neat was, after the solar maximum, & because

the Sun was to set behind the building, the temperatures dropped & it became comfortable.

Jean & Cheryl were my contacts for this event. Many, many thanks goes to them for their planning abilities. This was one major event! There was red lighting around most of the area so that it didn't disrupt viewing through the scopes. The bar stations had red lighting, and along the outside of the garden was a thin concrete circle, for which glass jars with reflective confetti & red lights were set up. All the main lights of the place were turned off, as much as possible. There were the 10 scopes we brought with us (PAS Members), plus a bunch of toy scopes set up as decoration. They were meant for the guests (Continued on page 4)

## JW Marriott May 20

(Continued from page 3) to use, but I didn't see anyone use them. There were bean bags, cots, mattresses, seating of wicker for the guests. The food smelled terrific.

Then the 800 guests arrived around 7pm. Most of the scopes, from what the guests said, were showing Saturn. I had Venus for a long time before it went behind the building. Then I moved to Saturn for a while. I also showed Alcor & Mizar for a little while. Then a gentleman, David, came over with his Ipad and he & I looked for the Cat's Eye Nebula and the Ring Nebula. The lighting there wasn't the greatest to show off those two nebulae, but we did find them, and showed them. Many of the guests spent time talking with us, asking questions and talking about what we were looking at, what type of telescope it was, etc. It was a steady stream of guests from start to finish.

Around 10pm, the band was still playing. So, I asked the Telescope Team to just hang out, keep showing stuff until we are informed we are free to pack up. It must have been about 10:30 before we started packing up.

By the time we packed up, it & loaded our vehicle, Don, John and us were the last to leave, and it was midnight. I was tired but not exhausted like other events. In fact, we got home & weren't sleepy right away. Went to bed about 2AM. This was an awesome event. Jean & Cheryl took very good care of us, thought through everything & really impressed me with their abilities to make an event, this huge, run so smoothly. For those who might wonder, yes, I slept like a log that night and the next night, catching up on the sleep from the whole week before, that I missed.

**Albert Tucker** writes: The Marriott team was setup in the ring of fire, surrounded by a ring of food.

**Rod Sutter** writes: Another great eclipse for May 2012, Sue and I arrived at 4:00, we were directed to the grassy area where we were suppose to set-up our scopes. After unloading and carrying our equipment up 6 stairs and then 10 yards to our set-up area, I set-up the Coronado PST to start viewing the eclipse. It actually started around just before 5:35 pm, my first picture was about 15 minutes after first contact. I was not paying attention to the sun, I was collimating my 16" and forgot



Photo by Terri Finch at the JW Marriott Solar Eclipse Private Event. This photo shows Albert Tucker viewing the Solar Eclipse through his Takahashi.



Photo by Rod Sutter. Rod writes "This is the beginning of the Solar Eclipse. This was shot through a 25mm eyepiece, with a Canon T3i set on Macro Mode. There is no other processing of the image."

what time it was, so my first pic was a little late.

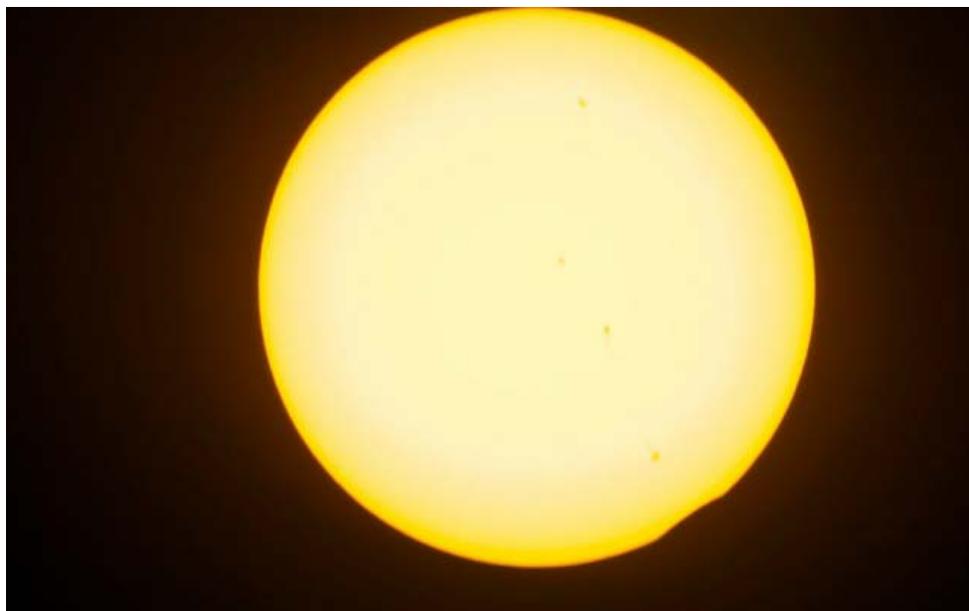
The eclipse went pretty fast, and before I knew it the sun had gone down and it was time to put away the PST and get my 16 out. I had a great turnout for the amount of people that was suppose to be there, our

hosts told us we should have about 800 people but I think it was more like 150-200. Even though it was a great night, there was a little smoke in the air from the Gladiator Fire in Crown King. You could see the smoke in the air just before sunset. I had my scope set on Mars for about an hour, then I went to M-57, then (Continued on page 5)

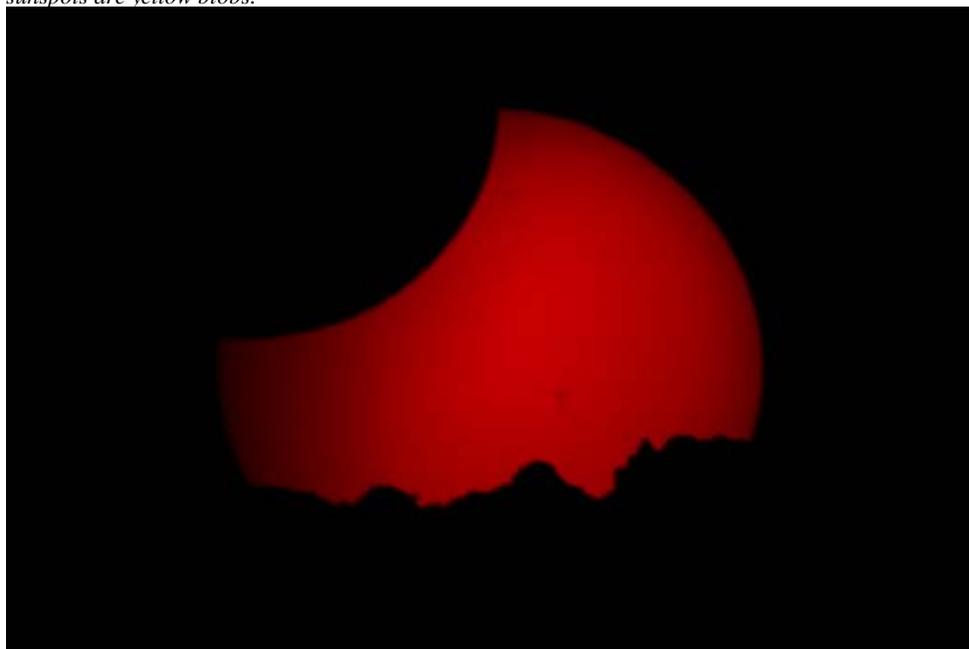
## JW Marriott May 20

(Continued from [page 4](#)) after that I turned to M-13. After things started to slow down, I had some of the guest come ask if they could view certain items such as Saturn. I told them that Bruce, who was set-up next to me was showing Saturn, and if they had anything else they wanted to see I would be glad to show them. I think that we finally got things shut down around 11pm, I know Sue and I got home just before midnight. Luckily I did not have to work then next day. All in all, it was a good night, one of my first in a long time, hope to do it again soon, well I guess I am, we will be out at Paradise Valley Community College north campus on June 5th for the Venus Transit. If you're not busy maybe you should come out and see what you've been missing in the wonderful night skies of Arizona.

**John Miller** writes: Since I was located a good distance from the speakers, it was nice to have some live, soft violin and flute music as a backdrop to the event. The number of lights illuminating the buffet tables and the general area made it a bit difficult for some depending on their location, but the audience was able to see enough to be genuinely appreciative. I was surprised at the number of people who showed up who confessed to having unused SCTs in mothballs at home. Hopefully, this reawakened their interest. I was also pleasantly surprised at the number of people who asked good questions or expressed how they felt/thought about what they were seeing. All in all, I thought this was a good event.\*\*\*



*Photo by Bob Christ. Bob writes: I was the first to yell "first contact" and snapped a picture. Unfortunately, since I had never taken an astrophoto before, I made a mistake in my excitement. In order to frame the Sun in the camera's finder, I had to set the exposure to 1/8 second and then set it to 1/80 to take pictures. I neglected to do this on the first shot so the picture is too exposed (the sunspots are yellow blobs).*



*Photo by Yves Klein. Solar eclipse at sunset. Canon EOS 60D with solar film. Because of how bright the surroundings and how dark the LCD of the camera was. It was very difficult to focus as you can see and low horizon atmosphere did not help*

## The Solar Eclipse of May 20, 2012

Photos of the Eclipse are in the PAS Photo Gallery at this link: [http://www.pasaz.org/forums/gallery.php?g2\\_itemId=10705](http://www.pasaz.org/forums/gallery.php?g2_itemId=10705)

**Bob Christ** writes: The beauty of an annular eclipse is the perfectly symmetrical

annulus (ring) that can be viewed from a precise point and time on the Earth as the Moon, at or near apogee, transits the Sun. The annulus is formed when the smaller angular diameter Moon blocks most, but not all, of the Sun's larger angular diameter light. Such an event is not common, and

viewing one that delivers a perfect annulus is most usually not logistically viable. We, in the southwest region, were afforded the opportunity on the 20th of May to view an annular eclipse. I trekked up to southern Utah, just over the Arizona border, and set up at the Lone Rock (Continued on page 6)

# The Solar Eclipse of May 20, 2012

(Continued from page 5) Campground situated at the Wahweap Bay section of Lake Powell. Positioned on an elevated plateau, I had an unfettered view to the west. The surrounding general locale was a hot-spot of folks that had descended to view the eclipse. The city of Page, AZ, held a formal eclipse-viewing event, and, at the campground, folks had come in from Tucson, Salt Lake City, communities in California, and even an amateur astronomer from New Jersey! Cars lined the highways as well, and police were in force to manage the havoc the event created. I had to be careful when answering timing questions because my reference was AZ time and I was in daylight savings time Utah. At the appointed time, "first contact" occurred, when the Moon first "touches" the Sun, and when the Moon had occulted the majority of the Sun there was a palpable drop in the ambient temperature and light. Through Tim Jones' camera attached to my scope, I was able to capture the various contact levels of the eclipse, and the attendant photo was taken during the concentric annulus phase. Particulars: 9.25' SCT scope, Canon EOS Rebel T1i, f6.3 focal reducer, #15 yellow/orange filter, remote shutter control, and 1/80 sec. shutter speed There are three aspects of the photo to note: 1) I framed this shot a tad too high in my excitement so the top portion of the Sun got clipped, 2) if you look closely the profile of the lunar landscape can be seen on the Moon's limb, and finally, 3) the symmetry of the annulus. The excitement, energy, and anticipation of the people in attendance was also palpable, and I feel most fortunate to have been able to view this event.

**Jen Perreault** writes: The kiddos, husband, and I attended an end of school year pool party/potluck with several other families. We brought along our eclipse glasses as did another family. Everybody took turns peering through the glasses throughout the eclipse. I don't think either pair of glasses ever got set down.

Dan Evander writes: While we know we have not been active in the club this year Rose and I did take time to travel up to Kanarraville UT, a location dead center to the annular eclipse. Accompanying us were our oldest granddaughter (Samantha, 19 and a UA student) and our son's exchange student from Germany, Christopher, 17. We also visited Bryce Canyon and Zion. Our location for the eclipse was the northbound rest stop on I-15. It has restrooms and picnic



*Photo by Rod Sutter. Image taken through a digital camera and his PST while at the JW Marriott Private Event.*

tables and was perfectly located, what more would you want? We took pictures of the people who came there for this event, about 100 at the rest stop and another 5,000 at Kanarraville, a town of normally 300. Also at the rest stop were about 10 professional astronomers and astrophysicist from Wyoming who brought all of their scopes and TV-monitor equipment. We watched the moon slowly eclipse the major sunspots and finally witnessed the dead on ring of fire. I did a time lapse with a 250mm lens with 8-second intervals shooting through an infrared filter. The apparent ambient light level when the moon was fully in the sun's arc was about as dark as it is just prior to sunrise and the temperature dropped about 15 degrees (we were at 6,500 feet elevation).

**Sam Insana** writes: My wife, Vera, and I went to a friend's wedding at a winery north of Prescott from 2 to 5 pm on Sunday May 20th. Right afterward we set up the



*Photo by Yves Klein. I-phone picture through Celestron. Reflections from the lenses are causing all the artifacts.*

PST and the 8 inch newtonian with the solar filter. The wedding guests enjoyed the sunspots, solar flares, and the 90% solar eclipse. Most had never looked through a telescope before. I also passed around the solar filter eyeglasses for people to enjoy the eclipse. Afterwards, about 20 of the guests remained to see Venus and then Saturn. The wine, food, and the eclipse made

*(Continued on page 7)*

# The Solar Eclipse of May 20, 2012

(Continued from page 6) for a great wedding experience.

**Dan Heim** writes: Besides fielding tons of last minute calls from people who wanted to know where they could get eclipse glasses (procrastinators!) I was set up here at Heimhenge to do a time-lapse sequence from first contact to max partiality through an H-alpha filter. I was using my Takahashi FS-128 with eyepiece projection at about 100x. The view was excellent. I was hoping to catch not only the silhouette of the Moon, which is the easy part, but also sunspots and flares. Unfortunately, some equipment problems prevented me from getting the exact focus I needed to show fine details. Still, I was able to do a pretty nice time-lapse sequence, which I have posted to the Astrophotos page of the DFAC website. The photography was a real burnout, with temps of 104. After max partiality, I relaxed and just did visual observing till sunset. I was joined by Roger Serrato, who was doing pretty much the same thing, but through a 135 mm telephoto on his DSLR using a neutral density filter. Haven't seen his results yet. Kai Staats was in town, and also joined us. He shot the event in real time using an HD camcorder through a mylar filter. Haven't seen that yet either.

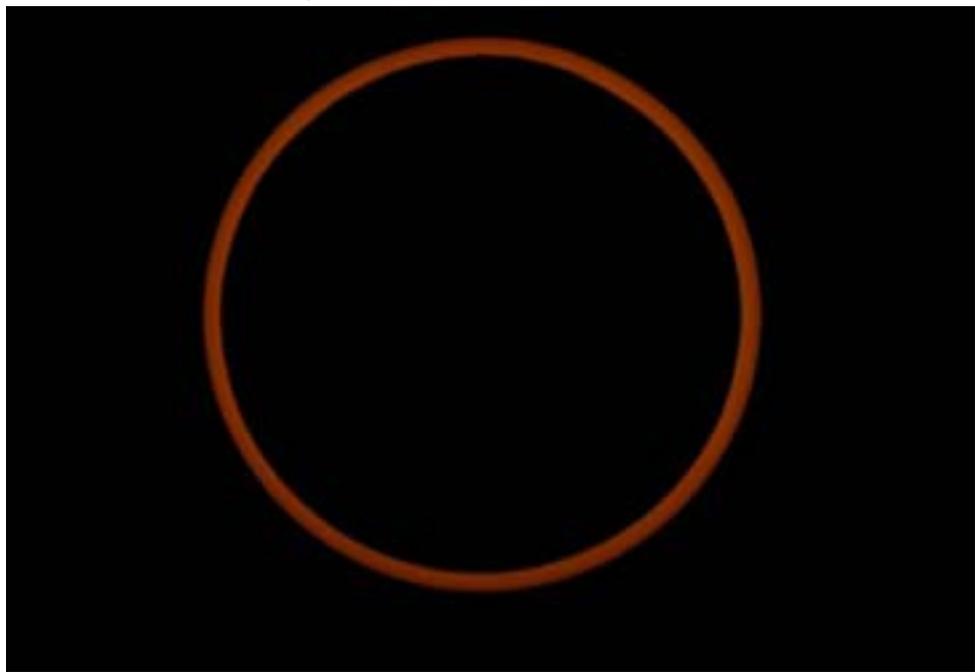
Here's the link to what our members (DFAC) captured: <http://www.dfacaz.org/astrophotos.html> Scroll down. The eclipse stuff is at the bottom of that page. Here is my Solar Eclipse animation: <http://www.dfacaz.org/astrophotos/2012-Eclipse-Heim.html>

**Dennis Laycock** writes: My wife, Wendy & I used solar glasses to view the eclipse directly and really see what it was supposed to look like. We started at 5:30 and checked out the progression every 15 minutes or so. When the sun dropped below our mountain, we drove to my Daughter's home where we let the Grandkids take turns looking too. My Son in law looked through the glasses and just put his shoebox away. The glasses were so much better than the cardboard box/pinhole method we were using before.

**Bob Senzer** writes: Joe and I hosted an ad hoc Eclipse party at Mike's house while he was attending the Eclipse event at the Marriott at Desert Ridge. We were house sitting when people started showing up. All



*Photo taken by Albert Tucker while at the Marriott Private Event.*



*Photo by Bob Christ. Taken at Wahweap Bay on Lake Powell*

told, there were approximately 15 individuals, most of whom stayed after the 6:40 PM peak of the eclipse. We had one pair of eclipse glasses, which were passed around. One person also used a pinhole in a sheet of heavy paper with a second sheet of paper behind it on which he projected the image.

There were a few children there who used the pair of glasses. Their parents warned them not to look directly at the sun and to the best of my knowledge they heeded this advice and only looked through the glasses. We all notice how the temperature dropped during the maximum (Continued on page 8)

# The Solar Eclipse of May 20, 2012

(Continued from page 7) part of the eclipse. A good time was had by all.

**Marc Levison** writes: There were hundreds of visitors gathered at Mather Point visitor center that Day.

**James DeSantis** writes: I went to Nevada to see the annular eclipse of the sun. I had never seen an eclipse before and I always wanted to, so I went. I went to a little town a hundred miles north of Las Vegas called Alamo. There was a gas station/ convenience store a mile from my room where people were viewing the eclipse so I took with my solar filter and went there. There were about twenty people and two telescopes specifically designed for solar viewing. One man was hooked up to the internet (wirelessly) and was broadcasting the eclipse live to people all over the world. He said there were 20 thousand people viewing his website. I don't know if that is true but it is certainly possible. Everyone had a great time and was very friendly.

I was unable to get a picture of the eclipse with my camera because it wanted to focus on the solar filter and not the image coming through the filter but that is alright because I can get one off the internet. The eclipse lasted about three minutes and the day was definitely darker and cooler during those 3 minutes. I was unable to see Venus so it didn't get that dark. I should say this is not a total eclipse but an annular eclipse which means the moon doesn't cover the entire disk of the sun but blocks out the middle of the disk like a donut. It is called the ring of fire. The shadows we cast were blurry at this time. I don't travel much but I am happy I took this trip; it is something I always wanted to see.

**Yves Klein** writes: We watched the magnificent annular eclipse on May 20th at Horseshoe Bend in Page Arizona. The experience was once in a lifetime. Thousands of people gathered like ants on the edge of that cliff that day; all equipped with cameras which would never be able to truly capture the moon's haunting gesture. We all waited patiently as the sun waned in the moon's creeping shadow. Then it became cold and the hills and canyons lost their color, and the world became an overexposed, antique photograph. Every single figure stared at the same place, eyes shielded by the dark glass we held in front of us. The lonely ring, however was not as stunning as the decrepit landscape before us (Continued on page 9)

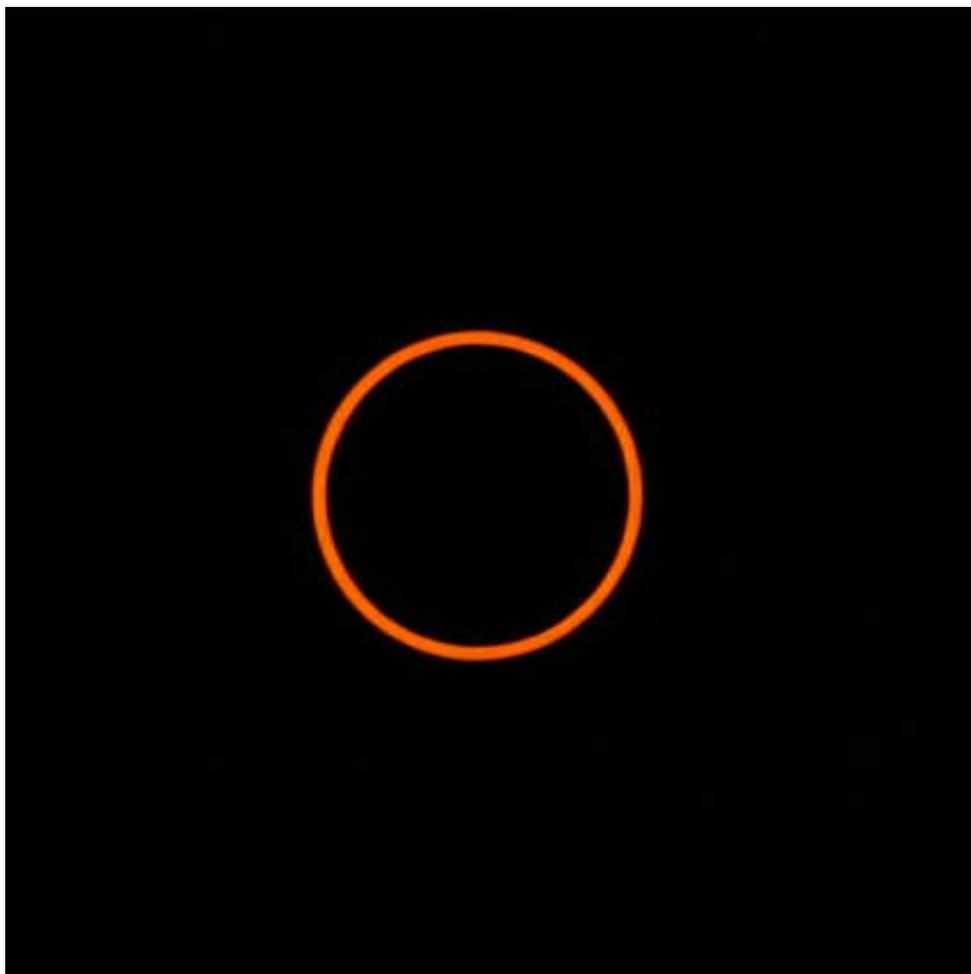


Photo by Dan Evander Dan writes "This one was taken a few moments before the moon exited the sun's rim & shows the effect the moon's landscape can have in splitting the sun's light."



Photo by Dan Evander. Dan writes "I did a time lapse with a 250mm lens with 8- second intervals shooting through an infrared filter."

# The Solar Eclipse of May 20, 2012

(Continued from page 8) which only moments before had glowed with sunset and life. The sun was gone at the wrong time of day, as the moon challenged the sun on a Sunday in May; and each dehydrated mesquite bush and cactus felt its absence. Then the hills released a sigh as the moon withdrew from its quest and the earth regained its color.

We tried to capture the event with our iPhones, cameras and Telescopes and appropriate filters each giving us a different aspect of this special moment. The main camera was a Canon EOS 60D with solar films or arc welding glass. The telescope we use was an old 1994 8" Celestron that we can carry around without too much difficulty. One Particular picture was unexpected the solar filter used did not fully cover the lenses and ended up taking part of the sky black with a very nice eclipse view and the landscape below. It almost looks like it was taken from low orbit. Some color adjustment and contrast was done to improve the overall picture and also burning on the moon part show more details.



*Photo by Dan Heim: Optics: Takahashi FS-128, Coronado H-alpha filter, eyepiece projection at about 100x Imaging: Canon EOS 20D, shutter priority, 1/200 second, ISO 200 (using mirror lock-up) Location: Heimhenge, New River, AZ*

## Many Thanks to Photographers

By Terri, Event Coordinator

I'd like to send out a special thank you to everyone who contributed to this Special Edition of the PAStimes Newsletter commemorating the Solar Eclipse of May 20 and the Venus Transit of June 5. Many thanks to those who sent photos to be included in this issue as well as in the PAS Photo Gallery. Thank you also for the reviews about those events.

Thank you to the Solar Eclipse photographers: Bob Chris (3), Albert Tucker (2), Dewell Howell (127), Kevin Adams (5), Rod Sutter (5), Dan Evander (2), Marc Levinson (4), Robert Ewing (20) & Dan Heim (1). The additional photos can be seen at [this link: http://www.pasaz.org/forums/gallery.php?g2\\_itemId=10705](http://www.pasaz.org/forums/gallery.php?g2_itemId=10705)

Thank you to the Venus Transit photographers: Megan Householder (8), Paul Schmidtke (11), Don Boyd (9), Alex Vrenios (1), Tim Jones (1), Laurice Dee (2), Robert Ewing (67), Kevin Adams (110), Dan Heim (1), Chris Boar (21), Leah Sapir (4). The link to see the collection of photos is at [this link: http://www.pasaz.org/forums/gallery.php?g2\\_itemId=11385](http://www.pasaz.org/forums/gallery.php?g2_itemId=11385)



*Photo taken by Dewell Howell through his 10" Dob with his digital camera while attending the JW Marriott Private Event*

Thank you all. Please feel free to submit photos and reviews, anytime, to the newsletter via [events@pasaz.org](mailto:events@pasaz.org).

# A Special Eclipse at a Special Place

By Leah Sapir

I had been looking forward to the 2012 solar eclipse for quite a while – for several years, in fact. It’s not every day when we have an event like this right in our own back yard. And even rarer when the Grand Canyon is right on the path of totality! A special astronomical event at a very special place – what more could you ask for?

And as part of my daydreams about the upcoming eclipse, I had hoped that it would be possible to organize a group of PAS members for a trip to the Grand Canyon, to have our own PAS eclipse party there. But when 2012 rolled around, PAS accepted a request for a private star party in the Phoenix area on the day of the eclipse. (I don’t even know whether the customer was aware that there was going to be an eclipse on that day, till we told them. I think they had just asked for an evening star party.) Now Phoenix is lovely, but I had so hoped to see the eclipse from the Grand Canyon. I wavered over whether to help out at the PAS party, or to drive up to the Grand Canyon alone.

Then, about two months before the eclipse, someone wrote to the PAS “astronomy questions” hotline with a question about the eclipse path. While researching the question, I found out that there was going to be an eclipse party right at the Grand Canyon! It was being organized by – who else? - TAAA (Tucson Amateur Astronomy Association), famous for their annual June star parties at the Grand Canyon. I was surprised that they hadn’t advertised it more widely – but I contacted them right away and asked if I could participate as a volunteer. Jim O’Connor from TAAA replied immediately that he would be happy to add me to the list. I was in! Things were looking up!

The week before the eclipse, I read articles about photographing eclipses, and practiced a little in my back yard with various pieces of equipment. I had a roll of Baader solar film that I had already used in the past to make filters for my scope (6” dob), binoculars (12x50), and two cameras. My Canon A620 (7 megapixels, and all settings manually adjustable) was my main camera for photographing the eclipse; I planned to use my older Olympus D-520 (2 megapixels, point-and-shoot) mostly for scenery shots, and as a backup. Besides these items, I also had a small projection apparatus called a “solarscope” ([www.solarscope.com](http://www.solarscope.com)) that uses a small (40 mm) telescope to *(Continued on page 11)*



Photo by Kevin Adams, PVCC Student. Kevin used a Canon Rebel T3.



Photo by Leah Sapir & taken with Olympus D-520 2.0 megapixel digital camera. Pinholes were punched in a sheet of cardboard forming the number 2012, and were used to project images on a screen, each pinhole showing an eclipsed image of the Sun.

## A Special Eclipse at a Special Place

(Continued from page 10) project the Sun's image on a shaded screen. It enables a group to safely view a solar eclipse or sunspots.

I especially rehearsed my "photo sequence" ahead of time in my back yard – taking a series of pictures of the Sun with different exposure times through my camera, while also constantly adjusting the position of the telescope and "solarscope" as the Sun moved, and being available to answer questions from tourists.

I prepared a pinhole projector as well. I tried different sizes of pinholes, and practiced with them in my back yard; I also tried them out indoors with a partially-covered flashlight to simulate the shape of an eclipsed Sun. When I was sure it all worked, I prepared two cardboard box-lids (12" x 17"): one with pinholes punched out to form the numbers "2012", and the other as the projection screen, with a background saying "Grand Canyon Solar Eclipse - May 20, 2012".

About five days before the eclipse, Jim sent out a "welcome package" and mentioned that most of the volunteers would be showing the eclipse from a location behind the Visitor Center, but the park rangers were requesting a few volunteers for "alternate locations". I wrote back asking to be at an "alternate location", preferably something scenic. They were going to distribute the location assignments on Saturday, and I would only be able to arrive on Sunday; but Jim said he would keep me in mind when they handed out assignments.

On Sunday morning I packed up my car and drove up to the Grand Canyon. When I arrived at the Visitor Center, there was a note from Ranger Marker Marshall, the contact person at the park for all the star parties: my request for a scenic "alternate location" had been approved! I should immediately go out behind the Visitor Center and look for a ranger with a jeep; he would drive me and my equipment out to Hopi Point. So, I found the ranger and jeep and we loaded up my telescope, "solarscope", pinhole projector, and tripod, and a tote bag that contained my cameras, eyepieces, filters, "eclipse viewer" glasses, etc. Although I had brought binoculars, I decided to leave them behind in my car; I wanted my tripod for the camera, and would probably be busy enough anyway with the scope, camera, and "solarscope" without trying to keep the binoculars (Continued on page 12)

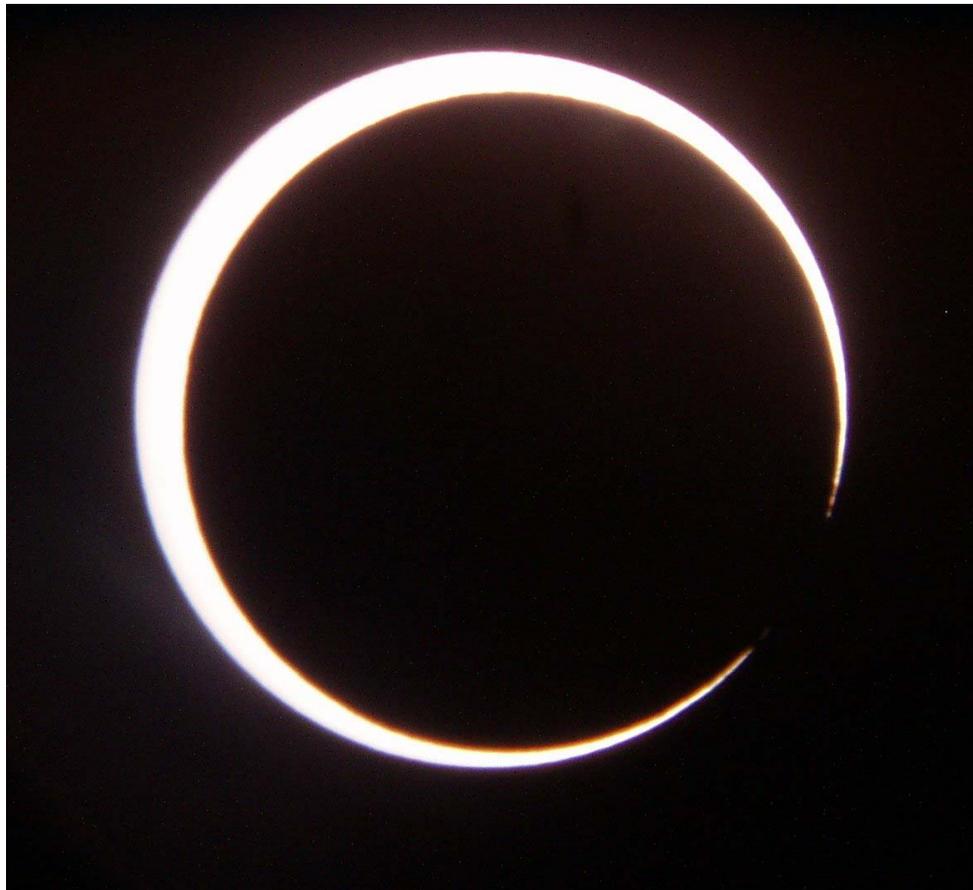


Photo by Leah Sapir. Leah writes "Annular eclipse maximum, seen through my 6" Newtonian reflector."



Photo by Leah Sapir & taken with Olympus D-520 2.0 megapixel digital camera. Tourists watching the solar eclipse at the Grand Canyon.

# A Special Eclipse at a Special Place

(Continued from page 11) focused on the eclipse as well.

Hopi Point was, as usual, breath-taking. It would be a great place to observe the eclipse – everything I had dreamed of. We still had an hour or so before the eclipse, but I started to set up my equipment. Several people had already set up scopes and binoculars. Most of the people already had eclipse viewer glasses.

I noticed a young couple setting up a tripod with a rather expensive camera, and asked them whether they had a filter for it. They replied that they had been told that the eclipse “wouldn’t hurt the camera.” I told them, that might be true, but they wouldn’t be able to photograph anything either – the glare from the exposed part of the Sun would fill the image. I showed them the filters I had made for my two cameras – basically a square of Baader film, held in place between two rings of posterboard to make a tambourine-shaped filter that exactly fit the camera. They asked if I had any more of the Baader film. Umm, yes, sure I did – I had a whole roll of it back in the trunk of my car, parked near the Visitor Center. I had brought it all the way from Phoenix just in case it would be needed; and now that it was needed it was not accessible because I was at Hopi Point.

But then I had an idea. In my box of filters I also had four filters for my binoculars (one for each side of the binocs and then a second pair as backup). Like the camera filters, they were homemade, from a square of Baader film and two rings of posterboard. And I was not going to be using my binoculars for the eclipse! I took one of the filters and offered it to them, suggesting that they could use it as is if it fit, or even take off the posterboard and tape it over their camera’s lens; I did have a roll of scotch tape in my bag.

Another tourist asked if I had another filter like that to lend him. He was from India, and I asked him if he had seen the total eclipse that had passed through India and China in 2009. No, he had missed it; he had been in the US. Lucky that he was able to see the annular eclipse with us at the Grand Canyon!

In the end, I lent out all four binocular filters for use as camera filters.

Eventually the eclipse started. We all watched it through eclipse viewers; and from time to time, people took a look



*Photo by Leah Sapir. As eclipse max approaches, people view through telescopes and eclipse viewers, and a ranger explains the event.*



*Photo by Marc Levison taken from the Grand Canyon using a Nikon D7000 and 300mm lens with solar viewer attached to the front of the lens.*

through my telescope. The pinhole projector was a great hit too, especially with the kids, who took turns taking pictures of the number “2012” spelled out in images of the eclipsed Sun.

I did a series of photos through my camera about every 5-10 minutes. I also

used my old Olympus camera to take pictures through my telescope’s eyepiece. It took a little effort to adjust the angle to get a picture of the Sun and not the inside of the eyepiece, but most of the time I succeeded. I also showed others how to do it, and they also took pictures of the eclipsed Sun

*(Continued on page 13)*

# A Special Eclipse at a Special Place

(Continued from page 12) through my scope's eyepiece.

We all watched as the eclipse progressed; and when the "ring of fire" appeared, everyone applauded and some shouted, "we did it!" At first, this seemed sort of funny to me. What did we do, exactly? We didn't produce the Sun, Moon or eclipse. But, we had all travelled to a very special place to view the eclipse together – and we did!

In fact, even my husband – not quite an astronomy fan – had made a special effort to come down to the Grand Canyon to view the eclipse. He had been on a business trip and needed to drive that week from Seattle to Detroit – but on his way between those two points, he made a special detour and drove down to the Grand Canyon to see the eclipse. He didn't get to Hopi Point in time for us to view it together, but he was able to see it with the volunteers at the Visitor Center.

I tried to take some pictures of the Sun over the Grand Canyon during the maximum of the eclipse. I had hoped that since the Sun was so low in the sky, the natural dimming from low altitude plus its dimming due to the eclipse would enable me to get a picture of the eclipsed Sun and the canyon together. But, none of those pictures came out well. Without a filter, even with the above-mentioned dimming, the Sun's glare still filled the picture; and with a filter, the canyon wasn't visible. So, I needed to make do with separate pictures of the canyon by itself, and the Sun through my filtered scope. Still, even without the hoped-for photos of the eclipsed Sun over the Grand Canyon, I was glad I had made the effort to drive up to the canyon to see the eclipse there. I might not have the photos in my camera, but I will always have the pictures in my memory.

After the "ring of fire", we continued to watch the last stages of the eclipse till sunset; then the ranger drove the volunteers and our equipment back to the Visitor Center. My husband was still at the Visitor Center and was able to join me then for the rest of the evening program. After dark, I joined the other volunteers in a nighttime public star party in the parking lot behind the Visitor Center, under the dark star-filled Grand Canyon skies. A great end to a great day!



*Photo by Marc Levison taken from the Grand Canyon using a Nikon D7000 and 300mm lens with solar viewer attached to the front of the lens.*



*Photo by Bob Ewing, PAS Member. Photo taken with a Nikon D60 camera, no filter, and just the smoke. Photo was taken at his home in Rio Verde, AZ.*

## Eclipse Trivia

In June 2001, a total solar eclipse was about to cross southern Africa. To prepare, the Zimbabwean and Zambian media began a massive astronomy education campaign focused on warning people not to stare at the Sun. Apparently, the campaign worked. The locals took a real liking to the vocabulary, and today, the birth registries are filled with names like Eclipse Glasses Banda, Totality Zhou, and Annular Mchombo.

The next Solar Eclipse we can view from our location will be a Partial Eclipse on October 23, 2014. The instance of greatest eclipse (TD) will be at about 2:45pm Arizona time.

# 2 Solar Eclipse Photo Albums

By Terri, Event Coordinator

In the PAS Photo Gallery, there are 2 photo albums for the Solar Eclipse event of May 20. One album is the photos of the eclipse, taken by PAS Members and Guests of PAS. That link is: [http://www.pasaz.org/forums/gallery.php?g2\\_itemId=10705](http://www.pasaz.org/forums/gallery.php?g2_itemId=10705)

The second photo album is the photos of the JW Marriott event that 11 PAS Members attended. The link for that album is:

[http://www.pasaz.org/forums/gallery.php?g2\\_itemId=11114](http://www.pasaz.org/forums/gallery.php?g2_itemId=11114)

Please enjoy!



*Photo by Terri Finch at the JW Marriott Solar Eclipse Private Event. This photo shows John Miller setting up his scope & Laptop for photographing & displaying the Eclipse as it happens.*



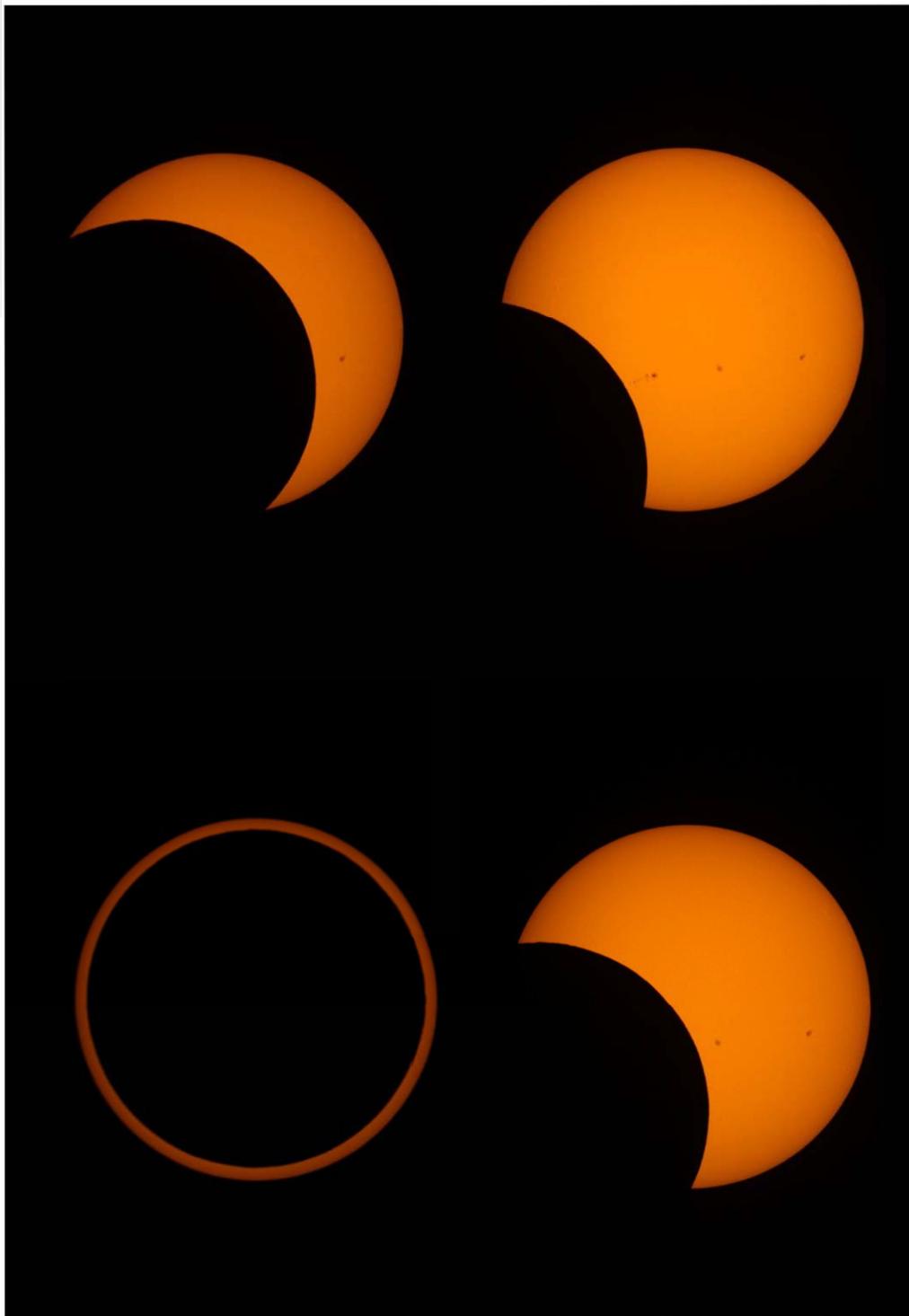
*Photo by Yves Klein. Solar eclipse at sunset. Canon EOS 60D with solar film. Because of how bright the surroundings and how dark the LCD of the camera was. It was very difficult to focus as you can see and low horizon atmosphere did not help.*

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## More Eclipse Trivia

During the recent eclipse we had a great syzygy! What is a syzygy? A syzygy (pronounced: SIZ-a-jee) is when three or more solar system objects line up in a straight line. An eclipse, whether solar or lunar, is a syzygy of the Sun, Moon, and Earth. Other examples of syzygy are also possible when we have a conjunction. (Although officially a syzygy requires all three objects to be in a straight line, for conjunctions we usually count it as a syzygy if they are almost in a straight line.)

The recent eclipse brought out a lot of umbraphiles! What is an umbraphile? It's a fancy name for a person who likes to see eclipses and will travel long distances to see them. An umbraphile can also be called an "eclipse chaser" but I think "umbraphile" sounds way cooler!



*Photo (above) by Bob Christ. This photo was taken at Wahweap Bay on Lake Powell. I used my 9.25" SCT, a 6.3 focal reducer, a #15 yellow/orange color filter, and Tim Jones' Canon T1i DSLR set to large/fine and a 1/80th shutter speed."*

*Photo (right) by Yves Klein. Photoshop improved Solar eclipse taken at horseshoes canyon near Page. The Picture was taken with Canon EOS 60D with solar film partially covering the sensor so the landscape could be seen.*

